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COMPARISON OF MAXILLO-MANDIBULAR TRANSVERSE RATIOS WITH CLASS II ANTEROPOSTERIOR DISCREPANCIES

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COMPARISON OF MAXILLO-MANDIBULAR TRANSVERSE WIDTH RATIOS WITH CLASS II ANTEROPOSTERIOR DISCREPANCIES

A THESIS

Presented to the Faculty of

Uniform Services University of the Health Sciences

In Partial Fulfillment

Of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Douglas Waterman, BS, DDS

San Antonio, TX

March 20, 2014

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COMPARISON OF MAXILLO-MANDIBULAR TRANSVERSE WIDTH RATIOS WITH CLASS II ANTEROPOSTERIOR DISCREPANCIES

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Dedication

I would like to express my appreciation for my wife's support, patience, and understanding while I abandoned her for my orthodontic residency. I will make it up to you!

Acknowledgement

I would like to thank Dr. Ricardo Vendrell, Dr. Brent Callegari, and Dr. Colin Mihalik for their mentorship with this thesis.

ABSTRACT

Introduction: The transverse dimension is arguably the most underdiagnosed problem when treatment planning individuals for orthodontics. Posterior-anterior cephalographs (PA ceph) are routinely taken to help diagnose transverse discrepancies. However, PA cephs are often difficult to read due to overlapping structures and represent a three-dimensional structure in two-dimensions. With the advent of cone beam computed tomography (CBCT), a more accurate measurement of maxillary and mandibular widths is possible. Unlike the PA ceph, the CBCT represents the landmarks in three-dimensions, and anterior landmarks can be precisely measured. A common deduction for subjects with anterior-posterior (AP) discrepancies is that they may have maxillo-mandibular width discrepancies as well. By determining if maxillo-mandibular width ratios are related to AP discrepancies in the Class II population, treatment efficiency can be improved. Knowing that populations can be Class II due to a protrusive maxilla, or a retrusive mandible, these Class II populations were compared to a Class I population to determine if maxillo-mandibular width ratios among these groups were similar or distinct. **Materials and Method:** CBCTs were reviewed and the landmarks identified for 90 subjects. Groups were divided into Class I, Class II due to maxillary protrusion, and Class II due to mandibular retrusion. Each group contained 30 subjects. Anterior and posterior widths were measured for the maxilla and mandible using skeletal and dental landmarks. Both the anterior widths and posterior widths of the maxilla and mandible were compared to assess interarch width relationships. These measurements allowed the comparison of both Class II populations to the class I population with respect to maxillo-mandibular width ratios. **Results:** All groups shared very similar ratios for each

maxillo-mandibular width ratio. The most consistent ratio for all three groups was the distance between the Greater Palatine Foramen divided by the distance between the Lingula. This result was surprising since the inter-lingula distance proved to be one of the most inconsistent transverse measurements. Furthermore, the least consistent ratio was the distance measured between the Infraorbital Foramen divided by the distance between the apices of the mandibular canines. This result also was unexpected since the distance between the mandibular canine root apices proved to be one of the most reliable measurements. **Conclusion:** There is no significant difference in the anterior and posterior maxillo-mandibular width ratio among Class I, Class II maxillary protrusive, and Class II mandibular retrusive populations. Also, posterior maxillo-mandibular width ratios appear to be more reliable than anterior ratios.

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I. BACKGROUND AND LITERATURE REVIEW

A. Background

Initial records for an orthodontic appointment usually consist of radiographs, an oral exam, photos, and impressions. The records are made in order to develop a diagnosis and treatment plan for the patient. In order to properly diagnose a patient, the clinician must account for the dental and skeletal components. This includes diagnosing the transverse, anteroposterior (AP), and vertical dental and skeletal relationships. Malocclusion can occur in all three planes of space and result from dental, skeletal, or both dental and skeletal anomalies. Dental malocclusion is easier to diagnose than a skeletal malocclusion as the examiner can visualize the malocclusion clinically and with the aid of diagnostic models. Skeletal malocclusions are more difficult to diagnose because the use of radiographs is often required. Adding to the difficulty of diagnosing a skeletal malocclusion is the reliability of tracing the cephalometric landmarks (Cortella 1997). Perhaps the least diagnosed skeletal planar discrepancy is the transverse dimension. Most orthodontists use lateral cephalograms to diagnose and treatment plan cases, which is valuable for AP and vertical measurements, but useless for transverse relationships. Even though transverse skeletal relationships are vital to an orthodontic diagnosis and treatment plan, only 13% of practicing orthodontists reported using PA cephalometrics as part of their records (Cortella 1997). Hsiao et al report that “the PA cephalogram is important for the correct diagnosis and quantification of bilateral structure problems and craniofacial widths.” Thus, because most orthodontists do not routinely use PA cephalometrics as part of

their diagnoses, the majority of orthodontic cases have an increased potential for misdiagnoses.

Skeletal growth proceeds in a cephalocaudal gradient and occurs in all three planes of space. Growth cessation first occurs in the transverse direction, then the AP direction, and lastly, the vertical direction. Unlike sagittal and vertical growth, skeletal transverse growth in males has been shown to be the only measurement to cede by age 18 (Snodell 1993). Knowing that transverse growth terminates first, an early diagnosis of transverse discrepancy is vital for treatment purposes. An indicator of a transverse skeletal or dental discrepancy is a posterior crossbite. The prevalence of posterior crossbites has been estimated to be between 7%-23% in the mixed dentition (Steven 2005). The diagnosis of skeletal and dental transverse discrepancies can be masked by dental compensations. Frequently the mandibular posterior teeth will roll in lingually to compensate for a maxillary transverse deficiency, while the maxillary posterior teeth will roll out buccally. Diagnosing a skeletal transverse discrepancy requires a posteroanterior (PA) ceph. However, although PA cephs are adequate for diagnosing skeletal asymmetries, they are not very useful in quantifying transverse discrepancies without asymmetries (Steven 2005). There are several analyses that are used to identify maxillary and mandibular transverse discrepancies. Two of the most common analyses are the Grummons Analysis and the Ricketts Analysis (Cortella 1997). When calculating maxillary and mandibular width, both analyses use the same points. To calculate the width of the maxilla, the examiner measures the distance between the jugal points (JL-JR); and to measure the width of the mandible, the examiner measures the distance between the antegonial notches (AG-GA). The normal

width difference between the maxilla and mandible should be 19-20mm in the adult (Ricketts 1982). These reference points are adequate if the examiner is only interested in the posterior widths of the maxilla and mandible. Unfortunately, if the examiner is interested in the transverse width at a more anterior location, then these analyses are obsolete. Given the certainty that transverse deficiency or excess can occur throughout the length of the maxilla and mandible, anterior reference points must be added to ensure a more accurate diagnosis.

As with traditional lateral cephalographs, traditional PA cephalographs have inherent problems. One of the main issues with traditional cephalographs is that three dimensional (3D) skeletal structures are represented as two dimensional (2D) objects. Furthermore, the reliability of identifying the structure points has shown to be at best unreliable (Jacobson 1995). "2D landmarks may be hindered by rotational, geometric, and head positioning errors. These errors may lead to inaccurate representation of anatomic landmarks, or poor visualization of some structures" (de Oliveira 2009). Furthermore, 3D structures presented in 2D format have issues with magnification, distortion, superimposition, and misrepresentation (Scarfe 2008). With the advent of cone beam technology, the examiner can visualize the patient's skeletal features in 3D. The 3D capability allows coronal, sagittal, or axial slices to be made at any location in the skull. This technology creates the possibility of using more points for skeletal measurement. Instead of being confined to points on the outer surfaces of skeletal structures, the examiner can slice the structure to utilize points on the inner surface.

Every occlusion has features that allow it to be classified into specific classes. A normal occlusion defined by Edward Angle occurs when the mesiobuccal cusp of the

maxillary first molar occludes in the buccal groove of the mandibular first molar; and the line of occlusion follows a smooth catenary curve (Proffit, 2013). Using the latter normal occlusion as the gold standard, Edward Angle developed the Angle's Classification of malocclusion. There are three Classes of malocclusion. Class I malocclusion is present when the maxillary and mandibular molar relationship is normal, but the line of occlusion does not follow a smooth catenary curve. Class II malocclusion occurs when the mesiobuccal cusp of the maxillary first molar is mesial to the buccal groove of the mandibular first molar. Finally, Class III malocclusion is present if the mesiobuccal cusp of the maxillary first molar is distal to the buccal groove of the mandibular first molar. Dr. Angle's approach to dental Classification focused on the anterior-posterior relationship of the teeth. With the use of diagnostic models, the orthodontist can easily measure anterior-posterior, vertical, and transverse relationships of the dentition.

When determining skeletal Class I, II, or III, there are many variables compared to the dental classifications. With dental classification the orthodontist is mainly examining the relationship of the first molars, but when determining a skeletal relationship, the orthodontist is concerned with multiple skeletal landmarks from which cephalometric angles and lengths are calculated. One such case in which there are many methods to diagnose a skeletal classification is with the Class II individual. An individual can be a skeletal Class II owing to a protrusive maxilla or a retrusive mandible. The commonly used analyses to determine skeletal Class II are the Downs, Steiner, Ricketts, and McNamara. The Downs analysis uses the Angle of Convexity to measure the relationship of the maxilla to the mandible. The Angle of Convexity is made by the intersection of the Nasion (N)-A point line with the A-Pogonion (Pog) line.

The norm for this angle is 0 degrees with a standard deviation of 5.1 for a Class I individual (Riolo 1974). Thus, an angle of convexity greater than 5.1 degrees would indicate a Class II skeletal relationship. The Steiner analysis uses the angle formed by A point-Nasion-B point to determine skeletal relationship. The average Class I individual has 2 degrees with a standard deviation of 2 degrees; so a Class II skeletal relationship according to Steiner has an A-N-B angle greater than 4 degrees (Riolo 1974). Ricketts uses the Facial Angle, which is the angle formed between the line Pogonion-Nasion and Frankfort's Horizontal Line (Porion-Orbitale). The average angle is 85.4 degrees with a standard deviation of 3.7 degrees (Riolo 1974). Therefore, a Class II skeletal relationship has a Facial Angle greater than 89.1 degrees. Finally, McNamara identifies the maxillo-mandibular relationship by comparing the length of the maxilla (condylion to A point) to the length of the mandible (condylion to gnathion). The length of the maxilla is subtracted from the length of the mandible. Depending on the anatomic sizes used for this relationship, McNamara has mean ranges, with small being 20mm, medium 25-27mm, and large 30-33mm (Jacobson, 1995). Measurements below the mean indicate a Class II relationship, whereas measurements above the mean indicate a Class III relationship. Although the Downs and Steiner analyses establish a skeletal relationship between the maxilla and the mandible, they do not give a clear indication of which jaw is at fault for a skeletal discrepancy.

Determining a skeletal Class malocclusion for diagnostic purposes is necessary for a proper treatment plan, but is meaningless unless the offending jaw is identified. In Rosenblum's 1994 study: *Class II malocclusion: mandibular retrusion or maxillary protrusion?*, he discusses four methods used to quantify whether a maxilla or mandible

is protrusive or retrusive (Rosneblum 1994). To distinguish between maxillary protrusion and retrusion, Rosenblum compared the accuracy of the Lande Angle (NA-FH), the Coben ratio (Basion-A:Basion-N), the Riedel's S-N-A angle, and McNamara's A point to Nasion perpendicular to FH. On the other hand, to quantify the protrusion or retrusion of the mandible, Rosenblum used Downs Facial Angle (NPog-FH), the Coben ratio (Ba-Pog:BaN), Riedel's SNB angle and McNamara's Pog to N perpendicular to FH. The results of Rosenblum's study demonstrated that, "…in the maxilla all indicators except SNA are closely correlated…In the mandible all indicators except SNB are also closely correlated." Measurements using the cranial base (Sella-Nasion) as a reference can be affected by the length of the cranial base (Jacobson 1976). Longer cranial base lengths can cause the SNA and SNB values to be smaller, thus causing errors in the true maxillary and mandibular sagittal positions. Rosenblum concludes that the "gold standard" for mandibular AP positioning is the Downs facial angle, whereas the most reliable AP measurement for the maxilla is the Lande angle (Rosenblum 1994).

Quantifying transverse discrepancies of the maxilla and mandible in the skeletal Class II population has been thoroughly studied (Slaj 2010) (Ball 2010) (da Silva 2008) (Varella 1998) (Rosenblum 1994) (Franchi 2005) (Tancan 2005). Many of these studies have shown mixed results. In the Class II population, the majority of studies show that the maxillary transverse width is narrower when compared to the Class I population (da Silva 2008) (Varella 1998) (Franchi 2005) (Bishara 1996) (Tancan 2005) (Lux 2003) (Basaran 2008). Other studies show that there is no difference in maxillary width among Class I and Class II individuals (Ball 2010) (Sayin 2004). Whereas, Slaj showed that the mandible is narrower in the Class II population compared to the Class I population

(Slaj 2010). The issue with many of these studies is that they did not specify the reason for the Class II diagnosis. As a skeletal Class II can be caused by either a protrusive maxilla or a retrusive mandible, there are certain to be differences in the transverse width of the maxilla in these two cases. However, there is presently no research on the transverse discrepancies in the maxilla when comparing the patient that is Class II due to maxillary protrusion to the patient that is Class II due to mandibular retrusion.

There are different treatment modalities when encountering a transverse deficiency in the maxilla and a transverse deficiency in the mandible. Yet, before a clinician can treat the transverse deficiency, it must be first properly diagnosed. According to Betts, “treatment of skeletally mature patients is often complicated by inadequately treated or undiagnosed transverse skeletal discrepancy “ (Betts 1995). To help prevent undiagnosed or misdiagnose transverse discrepancies, the clinician should include a PA ceph as part of their records. However, even when a traditional PA ceph is used, properly identifying the appropriate landmarks can be a challenge. Conversely, if the clinician uses a CBCT image, the data can be manipulated to use both posterior and anterior points for diagnosing transverse discrepancies. By using posterior and anterior landmarks on the maxilla and the mandible, the provider is able to obtain a more comprehensive diagnosis of an arch’s varying widths. Stewart and Brewer, in their unpublished Master’s theses, showed that when using a CBCT, reliable posterior and anterior landmarks can be used in measuring the transverse width of the maxilla and mandible (Stewart, 2012) (Brewer, 2012). Stewart found that for the mandible, the most reliable posterior landmarks were the alveolar ridge at the first molar and the lingula, while the most reliable anterior points were the canine root apices and the

mental foramina (Stewart 2012). Brewer found that for the maxilla, the most reliable posterior landmarks were the maxillary first molar palatal root apices and the greater palatine foramina, while the most reliable anterior points were the canine root apices and the infraorbital foramina (Brewer 2012). Thus, by using posterior and anterior landmarks to identify transverse discrepancies, a more thorough diagnosis can be achieved.

II. Objectives

A. Overall Objective

The intent of my research is to establish whether or not the maxillary and mandibular width ratio is affected by the anteroposterior positioning of the arch in the Class II population. I will compare and contrast the Class II population diagnosed with a protrusive maxilla and the Class II population diagnosed with a retrusive mandible to a Class I population. By establishing a difference in the maxillo-mandibular width ratio in distinct Class II populations when compared to a control Class I population, I hope to show that subgroups within the Class II population should be treatment planned differently. Revealing transverse discrepancies among the subgroups of the Class II population can improve the diagnosis and treatment of these individuals.

B. Specific Hypothesis

There is no difference in the maxillo-mandibular width ratio in the Class I and Class II populations, regardless of whether or not the Class II is due to a protrusive maxilla or a retrusive mandible.

III. MATERIALS AND METHODS

This retrospective study included patients who were evaluated at the Tri-Service Orthodontic Residency Program (TORP) with pretreatment CBCTs on file, taken on Classic i-CAT™ machines (Imaging Sciences International, Hatfield, PA). The Class I data pool was compiled by (Stewart 2012) and (Brewer 2012) as part of their master's thesis. They searched the TORP's Dolphin Management™ (Dolphin Imaging and Management, Chatsworth, California) database, and found 30 subjects who were selected based on inclusion criteria to comprise the Class I normal group. These subjects met the following criteria:

Class I

1. Be at least 14 years old for female or 16 years old for male subjects
2. Skeletal Class I with bilateral Class I molars and canines with an ANB of 2°-5°
3. Non-ectopic canines (no impactions)
4. No crossbites or transverse dental compensations (as diagnosed by the treating resident/staff doctor)
5. Have mandibular plane value (SN-MP) less than 38 degrees
6. Have less than 8mm crowding.

Class II patient populations were also found using TORP's Dolphin Management database Dolphin Management™ (Dolphin Imaging and Management, Chatsworth, California). Thirty patients who were Class II due to a protrusive maxilla were chosen with the following criteria:

Class II Due to Prognathic Maxilla

1. Be at least 14 years old for female or 16 years old for male subjects
2. Skeletal Class II with bilateral Class II molars and canines.
3. Non-ectopic canines (no impactions)
4. Have mandibular plane value (SN-MP) less than 38 degrees
5. Have less than 8mm crowding.
6. Lande angle (NA-FH) of ≥ 90°
7. ANB≥5°

Thirty patients who were Class II due to a retrognathic mandible were chosen with the following criteria:

Class II Due to Retrognathic Mandible

1. Be at least 14 years old for female or 16 years old for male subjects
2. Skeletal Class II with bilateral Class II molars and canines.
3. Non-ectopic canines (no impactions)
4. Have mandibular plane value (SN-MP) less than 38 degrees
5. Have less than 8mm crowding.
6. Facial Angle (PogN-FH) of ≤ 85°
7. ANB≥5°

In Brewer's and Stewart's patient populations, a faculty member not associated with their studies approved all patients from the Tri Service Orthodontic Residency Program (TORP) archived patient database. Patient's name, age, and any other

personal information were de-identified. The Class I patient's CBCT was then identified by "MAN-II" and an identification number "1-30."

In this author's study, the Class I patient group was compiled from the patients used by Brewer and Stewart. Many of the Class II patients were used from Stewart's study as well. However, because this author's study's selection criteria differed slightly from Stewart's criteria, several Class II subjects were included that were not part of Brewer's or Stewart's research. This study used criteria that separated Class II subjects into two groups; Class II due to maxillary protrusion, and Class II due to mandibular retrusion. The patients who were Class II due to a protrusive maxilla were identified by "PROG" and an identification number "1-30." The subjects who were Class II due to a retrognathic mandible were identified by "RET" and an identification number "1-30." The data was resaved in the patient database for the examiner to view. The examiner oriented and saved each radiograph in simulated natural head position, with Frankfort horizontal parallel to the floor and the line connecting midpoints of Christa Galli (CG) and Anterior Nasal Spine (ANS) perpendicular to the floor. All landmarks were labeled using the Dolphin™ 3D software application (Dolphin Imaging, and Management, Chatsworth, CA) and measured in the transverse plane. The investigator utilized measurement tools in Dolphin Imaging Software™, (Dolphin Imaging Software, California). In order to verify the reproducibility of measurement between landmarks, the author repeated many of the same measurements made by Brewer and Stewart.

CBCTs were reviewed and the landmarks identified. Anterior and posterior widths were measured for the maxilla and mandible using skeletal and dental landmarks. Both the anterior widths and posterior widths of the maxilla and mandible

were compared to assess interarch width relationships. These measurements allowed the comparison of both populations of Class II to the Class I population with respect to maxillo-mandibular width ratios. See below tables for inter-landmark measurements and maxillary/mandibular width ratios.

Width Measurements (mm)

	Landmark	Raw Average	Std Dev	Max	Min	Intrarater reliability (avg std dev/pt)
ANTERIOR	IF-IF					
	CRA-CRA					
	CR-CR					
	MF-MF					
POSTERIOR	GPF-GPF					
	MRA-MRA					
	L-L					
	AvRM-AvRM					

RATIOS (Anterior Mx/Mn Width Ratio)

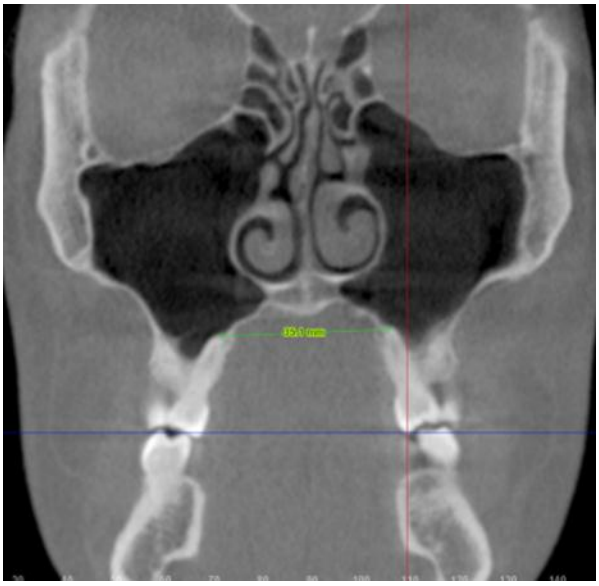
	IF:MF	IF: CR	CRA: MF	CRA:CR
Average				
St Dev				
Maximum				
Minimum				

RATIOS (Posterior Mx/Mn Width Ratio)

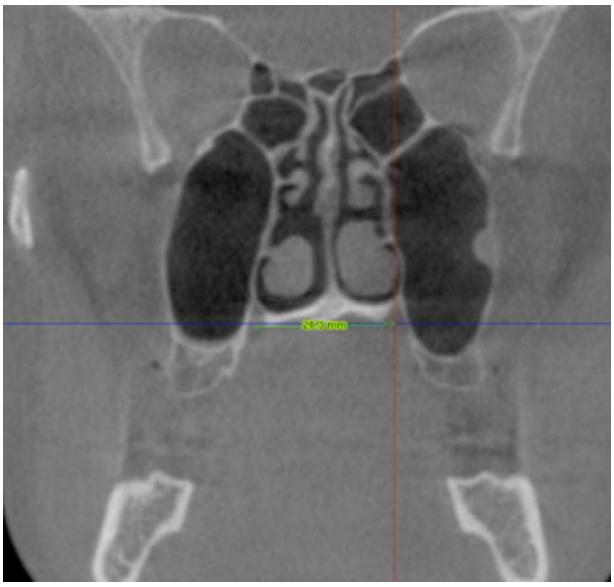
	GPF:L	GPF:AvRM	MRA:L	MRA:AvRM
Average				
St Dev				
Maximum				
Minimum				

Key
AvRM=Alveolar ridge at mandibular first molar
CR=Mandibular canine root apex
CRA=Maxillary canine root apex
GPF=Greater palatine foramen
IF=Infraorbital foramen
L=Lingula
MF=Mental foramen
MRA=Maxillary first molar palatal root apex

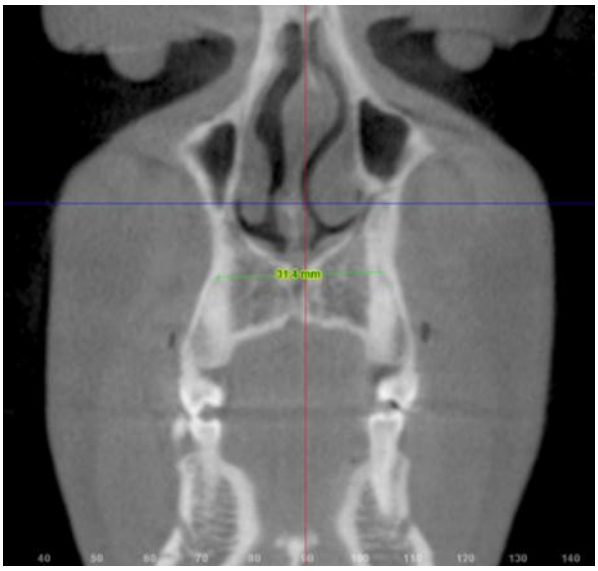
MRA-MRA (Maxillary Posterior Measurement) (Brewer, 2012)



GPF-GPF (Maxillary Posterior Measurement) (Brewer, 2012)



CRA-CRA (Maxillary Anterior Measurement) (Brewer, 2012)



IF-IF (Maxillary Anterior Measurement) (Brewer, 2012)

L-L (Mandibular Posterior Measurement) (Stewart, 2012)

AvRM-AvRM (Mandibular Posterior Measurement) (Stewart, 2012)

MF-MF (Mandibular Anterior Measurement) (Stewart, 2012)

CR-CR (Mandibular Posterior Measurement) (Stewart, 2012)

B. Statistical Management of Data

The data was divided into independent and dependent variables. There were three independent variables. The independent variables were subjects with Class I malocclusion, subjects with Class II malocclusion due to a protrusive maxilla, and finally subjects with Class II malocclusion due to a retrusive mandible. The dependent variables were maxillo-mandibular width ratios calculated from linear measurements in the maxilla and mandible. Two anterior and two posterior measurements were made in both the maxilla and mandible. The linear measurements made in the maxilla were the distances between the following points: Greater Palatine Foramen (GPF-GPF), Maxillary first molar palatal Root Apex (MRA-MRA), Infraorbital Foramen (IF-IF), and Mandibular Canine Root Apex (CRA-CRA). The linear measurements made in the mandible were the distances between; Lingula (L-L), Alveolar Ridge at first Molar (AvRM-AvRM), Mental Foramen (MF-MF), and Mandibular Canine Root Apex (CR-CR).

The data collected was parametric in nature. This study assumed that the subjects chosen randomly from the TORP's database represent the desired population outside of TORP as well. Measurements in millimeters were made from the chosen skeletal and dental landmarks. All measurements made for the two Class II groups were compared to the control Class I group. Furthermore, all three groups were compared to determine if any differences exist among them. The Student's t Test and one-way-ANOVAS were used to compare groups, mean, standard deviation, maximum values and minimum values.

The descriptive statistics used consist of mean and standard deviation. There were 90 subjects divided into three groups of 30. Each subject had eight distinct transverse measurements made (four posterior and four anterior). Each transverse measurement was made three times. The mean and standard deviation of the three measurements were calculated for each subject. Once the transverse means were calculated for each subject, these means were used to calculate maxillo-mandibular width ratios. The following maxillo-mandibular width ratios were calculated: IF-IF/MF-MF, IF-IF/CR-CR, CRA-CRA/MF-MF, CRA-CRA/CR-CR, GPF-GPF/L-L, GPF-GPF/AvRM-AvRM, MRA-MRA/L-L, and MRA-MRA/AvRM-AvRM. After calculating the maxillo-mandibular width ratios for each subject, a group mean and standard deviation was calculated for each maxillo-mandibular ratio. These group means and standard deviations were used to compare potential differences among the groups.

The inferential statistical methods used for this research were the two-tailed homoscedastic Student's t Test and the one way ANOVA. For the Students-t test, the significance factor was set to $P < 0.05$. As each Class II group was compared to the Class I group, two Student's t Tests were administered. Since two separate Student's-t Tests were administered, a Bonferroni correction was used to reduce the significance factor to $P < 0.025$ (0.05/2). The Students-t test was used to determine if a maxillo-mandibular transverse discrepancy exists among Class I and Class II populations. The Students-t Test compared each group's mean value for each of the eight maxillo-mandibular width ratios. The significance factor for the one way ANOVA was set to $P < 0.05$. A one way ANOVA was calculated for each maxillo-mandibular width ratio for a

total of eight ANOVAs. The one way ANOVAs were used to determine if any significant differences were found among the three groups. A post-hoc Tukey's test was administered to determine which measurements were different among all three groups.

Both intra-rater and inter-rater reliabilities were calculated. The intra-rater reliability was calculated to be 0.44 using the Dahlberg Formula. This calculation shows that the author's measurements were accurate to within 0.44mm. A total of three raters made measurements between the identified landmarks. The author made several thousand measurements, whereas rater 1 and rater 2 made 360 measurements each. Due to the time requirement of making thousands of measurements, rater 1 and rater 2 each were tasked to measure different points within the Class I sample. The inter-rater reliability among the author and rater 1 was 0.989, whereas the inter-rater reliability among the author and rater 2 was 0.993. The inter-rater reliability demonstrated the overall credibility of using the chosen landmarks.

IV. Results

The transverse relationship between the maxilla and the mandible was evaluated in this study. Before calculating the maxillo-mandibular width ratio, the distances between landmarks were measured in millimeters. Two anterior bilateral landmarks and two posterior bilateral landmarks were used in both the maxilla and mandible. Data was collected from populations belonging to Class I, Class II due to a protrusive maxilla (CL II-P), and Class II due to a retrusive mandible (CL II-R). Given that different sized individuals can belong to the same skeletal classification, it can be assumed that differences in skeletal width can occur in the same skeletal classification as well. Thus, calculating the maxillo-mandibular width ratio represents a more accurate assessment of transverse discrepancies than simply measuring points between landmarks.

The measurements between landmarks for the Class I population can be seen in ***Table I***. ***Table I*** details the descriptive statistics including the mean, standard deviation, maximum value, and minimum value. The maximum and minimum values demonstrate the skeletal differences among a similar population. When looking at the thirty subjects in the Class I population, the maximum distance measured between the lingula was 90.67mm, whereas the minimum distance measured between the lingula was 68.47mm. This disparity of 22.2mm between the maximum and minimum values represents approximately 32% of the minimum value. The difference in landmark measurements between subjects of the same population highlights the importance of establishing a ratio for accuracy.

From most to least reliable in transverse consistency for the Class I population the landmarks were; Alveolar Ridge at the Mandibular first Molar (AvRM), Greater Palatine Foramen (GPF), Mandibular Canine Root Apex (CR), Maxillary Canine Root Apex (CRA), Maxillary first Molar Palatal Root Apex (MRA), Mental Foramen (MF), Infraorbital Foramen (IF), and lastly Lingula (L). In the Class I population, the most reliable measurement was between the alveolar ridge at the mandibular first molars (AvRM) with a standard deviation of 2.39. The clarity of the AvRM was extremely high. When measuring the distance between AvRM, the image was cut to show the individual canals of the mandibular first molar. AvRM was then measured at the bone buccal to the mesial root. The least reliable measurement was between the lingula (L) with a standard deviation of 4.92. The lingula was measured at the point where the lingual bone plate first started to appear around the nerve canal. The variability of location and large area representing the lingula made accurate measurement difficult. When cutting the cone beam radiographs, frequently the lingual bone would first appear on one side of the mandible, while the contralateral side showed no lingual bone. In this situation, the image was adjusted until both lingula showed lingual bone. Thus, one side had lingual bone beginning to show, whereas the other side had significant lingual bone present.

The Class I data representing the maxillo-mandibular width ratios is presented in ***Table 2***. Overall, the data suggests that the posterior maxillo-mandibular width ratios are more consistent than the anterior width ratios. CRA/MF proved to be the most consistent anterior width ratio with a standard deviation of .07, whereas IF/CR was the

least consistent anterior width ratio with a standard deviation of .10. The maximum value of IF/CR was 3.76, whereas the minimum value was 1.76. The difference between maximum and minimum IF/CR ratios is over 200 percent. This represents a large variability within the Class I population. MRA/AvRM represented the greatest difference between maximum (.83) and minimum (.33) values for the posterior ratio with a 169 percent difference. When considering the most to least consistent maxillo-mandibular width ratios for the Class I population, they were; GPF/L, MRA/L, GPF/AvRM, CRA/MF, MRA/AvRM, IF/MF, CRA/CR, and lastly IF/CR.

The measurements between the landmarks for the Class II due to a protrusive maxilla (CL II-P) population can be seen in ***Table III***. In the CL II-P group the most consistent to least consistent widths were as follows; CR, GPF, MRA, MF, AvRM, CRA, L, and lastly IF. As with the Class I population, the CLII-P data showed skeletal width variations. The greatest variation in measurement occurred between the infraorbital foramen (IF) with a standard deviation of 4.49. The most consistent measurement in the CL II-P group was the distance between the maxillary canine root apices (CRA), with a standard deviation of 2.08. Unlike the Class I group's most consistent measurement, which was between AvRMs, the most consistent measurement in the CL II-P group was between CRs. Although the most consistent measurements varied among the Class I and CL II-P groups, they shared the least consistent measurements being L and IF.

The CL II-P data representing the maxillo-mandibular width ratios is presented in ***Table 4.*** Similar to the Class I population, the maxillo-mandibular posterior width ratios appear

to be more consistent than the anterior width ratios. The most consistent CL II-P width ratio was GPF/L with a standard deviation of .03, whereas the least consistent width ratio was IF/CR with a standard deviation of .42. When considering the most to least consistent maxillo-mandibular width ratios for the CL II-P population, they were; GPF/L, MRA/L, GPF/AvRM, MRA/AvRM, CRA/MF, IF/MF, CRA/CR, and lastly IF/CR. The latter maxillo-mandibular width ratio consistencies are very similar to those found in the Class I population, with the exception being the transposition of MRA/AvRM and CRA/MF.

The measurements between landmarks for the Class II due to a retrusive mandible (CL II-R) population can be seen in ***Table 5***. In the CL II-R group the most consistent to least consistent widths were as follows; CR, GPF, MF, L, AvRM, MRA, CRA, and lastly IF. The most consistent measurement was between the maxillary canine root apices (CR) with a standard deviation of 2.17, whereas the least consistent measurement was between the infraorbital foramen (IF), with a standard deviation of 5.47. The latter finding mimics the most and least consistent width values of the CL II-P population.

The CL II-R data representing the maxillo-mandibular width ratios is presented in ***Table 6***. Similar to the Class I and CL II-P populations, the maxillo-mandibular posterior width ratios appear to be more consistent than the anterior width ratios. The most consistent CL II-R width ratio was GPF/L with a standard deviation of .02, whereas the least consistent width ratio was IF/CR with a standard deviation of .39. When considering the most to least consistent maxillo-mandibular width ratios for the CL II-R population, they

were; GPF/L, MRA/L, GPF/AvRM, MRA/AvRM, CRA/MF, IF/MF, CRA/CR, and lastly IF/CR. The latter ranking of most to least consistent maxillo-mandibular width ratios mirrors that found in the CL II-P group, and closely resembles that found in the Class I group.

A Student's t test was used to compare the maxillo-mandibular width ratio of the Class I population to the CL II-P and CL II-R populations. The significance factor was adjusted from P<.05 to P<.025 using the Bonferroni correction. Given the significance factor of P<.025, none of the Class II maxillo-mandibular width ratios were significantly different from those of the Class I group. The GPF/L ratio was the closest to being statistically significant for the Class I and CL II-R groups with a significance value of P=.03. Further testing using eight one way ANOVAs was administered to reveal if any significant differences existed among all three groups. One way ANOVAs were run for each maxillo-mandibular width ratio including; IF/MF, IF/CR, CRA/MF, CRA/CR, GPF/L, GPF/AvRM, MRA/L, and MRA/AvRM. A post-hoc Tukey test was automatically generated with the ANOVA tests, and also revealed no statistically significant differences.

The data collected failed to reject the null hypothesis. ***Table 7*** illustrates the similar maxillo-mandibular ratios for populations who are Class I, Class II due to a protrusive maxilla, and Class II due to a retrusive mandible. For example, the mean IF/MF ratio for Class I, CL II-P, and CL II-R were 1.10, 1.11, and 1.14 respectively. Thus, the measurement between the infraorbital foramen divided by the measurement between

the mental foramen had only a one percent difference for the Class I and CL II-P groups and a four percent difference between the Class I and CL II-R groups. Some ratios were more similar among Class I and CL II-P groups, while other ratios were more similar among Class I and CL II-R groups, and other ratios were more similar among CL II-P and CL II-R groups. The similarities between all three groups can be visualized in ***Graphs 1A and 1B***.

Table 1- Class I Width Measurements (mm)

	Landmark	Raw Average	Std Dev	Max	Min
ANTERIOR	IF-IF	49.19	4.84	59.33	38.70
	CRA-CRA	28.59	3.13	36.77	21.17
	CR-CR	20.83	2.91	25.57	14.00
	MF-MF	44.96	4.69	52.17	39.93
POSTERIOR	GPF-GPF	28.84	2.75	33.20	22.40
	MRA-MRA	33.24	3.20	44.20	25.47
	L-L	80.17	4.92	90.67	68.47
	AvRM-AvRM	51.70	2.39	55.43	45.03

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

Table 2- Class I Maxillo-Mandibular Width Ratios

RATIOS (Anterior Mx/Mn Width Ratio)				
	IF:MF	**IF: CR**	**CRA: MF**	**CRA:CR**
Average	1.10	2.41	0.64	1.39
St Dev	0.10	0.44	0.07	0.24
Maximum	1.30	3.76	0.81	2.17
Minimum	0.91	1.76	0.48	1.12

	RATIOS (Posterior Mx/Mn Width Ratio)			
	GPF:L	**GPF:AvRM**	**MRA:L**	**MRA:AvRM**
Average	0.36	0.56	0.41	0.64
St Dev	0.03	0.06	0.05	0.09
Maximum	0.40	0.65	0.51	0.83
Minimum	0.30	0.43	0.33	0.49

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

Table 3- CL II-P Width Measurements (mm)

		Raw Average	Std Dev	Max	Min
ANTERIOR	IF-IF	50.69	4.49	61.43	41.37
	CRA-CRA	28.92	3.40	33.83	20.50
	CR-CR	19.90	2.08	25.93	14.67
	MF-MF	45.58	3.00	50.47	41.27
POSTERIOR	GPF-GPF	29.78	2.51	34.13	25.50
	MRA-MRA	34.54	2.92	40.10	30.33
	L-L	82.26	3.80	92.20	74.53
	AvRM-AvRM	52.65	3.11	59.83	46.60

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

Table 4- CL II-P Maxillo-Mandibular Width Ratios

RATIOS (Anterior Mx/Mn Width Ratio)				
	IF:MF	**IF: CR**	**CRA: MF**	**CRA:CR**
Average	1.10	2.41	0.64	1.39
St Dev	0.10	0.44	0.07	0.24
Maximum	1.30	3.76	0.81	2.17
Minimum	0.91	1.76	0.48	1.12
	RATIOS (Posterior Mx/Mn Width Ratio)			
	GPF:L	**GPF:AvRM**	**MRA:L**	**MRA:AvRM**
Average	0.36	0.56	0.41	0.64
St Dev	0.03	0.06	0.05	0.09
Maximum	0.40	0.65	0.51	0.83
Minimum	0.30	0.43	0.33	0.49

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

Table 5- CL II-R Width Measurements (mm)

	Landmark	Raw Average	Std Dev	Max	Min
ANTERIOR	IF-IF	50.99	5.47	63.83	44.30
	CRA-CRA	27.45	3.64	33.67	19.63
	CR-CR	20.17	2.17	28.57	15.53
	MF-MF	44.98	3.24	52.53	37.37
POSTERIOR	GPF-GPF	29.52	2.77	35.43	26.63
	MRA-MRA	33.60	3.44	40.43	28.30
	L-L	79.27	3.36	85.67	71.73
	AvRM-AvRM	51.57	3.40	58.77	44.03

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

Table 6- CL II-R Maxillo-Mandibular Width Ratios

RATIOS (Anterior Mx/Mn Width Ratio)				
	IF:MF	**IF: CR**	**CRA: MF**	**CRA:CR**
Average	1.14	2.56	0.61	1.38
St Dev	0.12	0.39	0.09	0.26
Maximum	1.47	3.91	0.80	2.16
Minimum	0.95	1.65	0.43	0.99
	RATIOS (Posterior Mx/Mn Width Ratio)			
	GPF:L	**GPF:AvRM**	**MRA:L**	**MRA:AvRM**
Average	0.37	0.57	0.42	0.65
St Dev	0.02	0.05	0.04	0.06
Maximum	0.42	0.69	0.51	0.75
Minimum	0.33	0.51	0.36	0.52

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

Table 7- Comparison of Maxillo-Mandibular Width Ratios Among Class I, CL II-P, and CL II-R Populations

RATIOS (Anterior Mx/Mn Width Ratio)													
	Class I Group				Class II Maxillary Protrusion Group				Classs II Mandibular Retrusion Group			
	IF:MF	IF: CR	CRA: MF	CRA:CR	IF:MF	IF: CR	CRA: MF	CRA:CR	IF:MF	IF: CR	CRA: MF	CRA:CR
Average	1.10	2.41	0.64	1.39	1.11	2.59	0.64	1.47	1.14	2.56	0.61	1.38
St Dev	0.10	0.44	0.07	0.24	0.09	0.42	0.08	0.25	0.12	0.39	0.09	0.26
Maximum	1.30	3.76	0.81	2.17	1.39	3.58	0.76	2.13	1.47	3.91	0.80	2.16
Minimum	0.91	1.76	0.48	1.12	0.96	1.82	0.41	0.92	0.95	1.65	0.43	0.99
RATIOS (Posterior Mx/Mn Width Ratio)												
	GPF:L	GPF:AvRM	MRA:L	MRA:AvRM	GPF:L	GPF:AvRM	MRA:L	MRA:AvRM	GPF:L	GPF:AvRM	MRA:L	MRA:AvRM
Average	0.36	0.56	0.41	0.64	0.36	0.57	0.42	0.66	0.37	0.57	0.42	0.65
St Dev	0.03	0.06	0.05	0.09	0.03	0.05	0.04	0.06	0.02	0.05	0.04	0.06
Maximum	0.40	0.65	0.51	0.83	0.42	0.66	0.49	0.81	0.42	0.69	0.51	0.75
Minimum	0.30	0.43	0.33	0.49	0.31	0.46	0.35	0.56	0.33	0.51	0.36	0.52

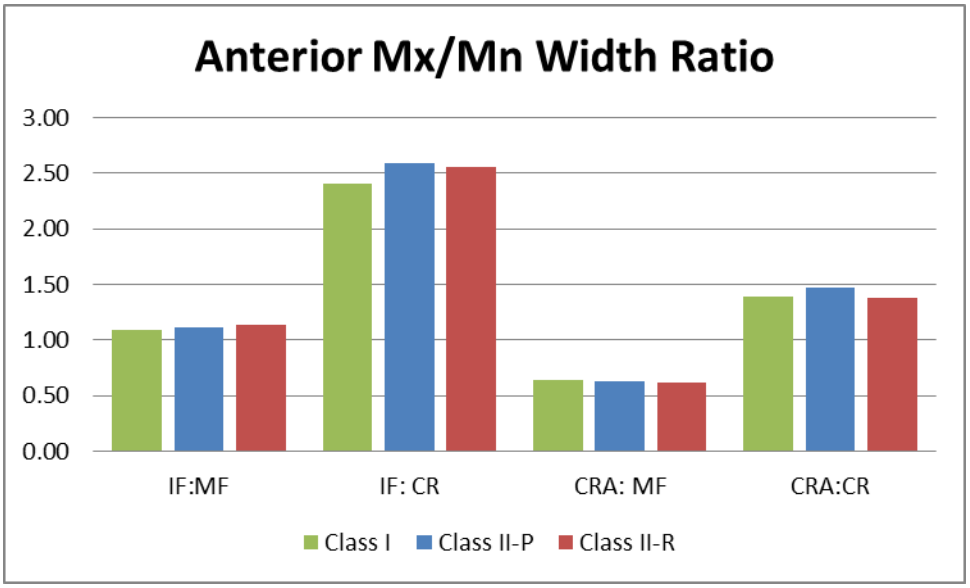
Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

Graph 1A- Comparison of Anterior Maxillo-Mandibular Width Ratios Among Class I, CL II-P, and CL II-R Populations



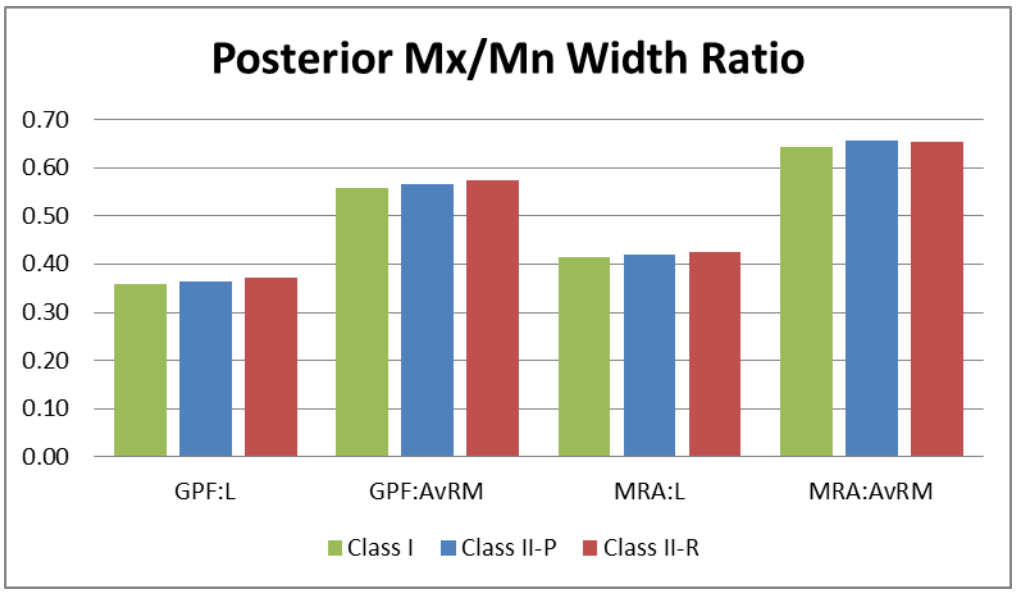
Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

Graph 1B- Comparison of Posterior Maxillo-Mandibular Width Ratios Among Class I, CL II-P, and CL II-R Populations



Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

V. Discussion

Identifying a skeletal Class II individual for treatment planning purposes is the first step in treating this skeletal anteroposterior discrepancy. Once the skeletal Class II relationship is identified, the examiner must then determine the jaw at fault. The best method in deciding which jaw is at fault for an anteroposterior discrepancy is by using the Lande Angle for the maxilla and the Facial Angle for the mandible (Rosenblum 1994). Prior studies have compared maxillary and mandibular skeletal widths for Class I and Class II populations. However, these studies did not differentiate whether or not the Class II was due to a protrusive maxilla (CL II-P) or a retrusive mandible (CL II-R). Furthermore, prior studies have not measured maxillo-mandibular width ratios using both anterior and posterior landmarks on the maxilla and mandible using cone beam images.

This study attempted to establish differences in maxillo-mandibular width ratios for subjects who are Class I, Class II due to maxillary protrusion, and Class II due to mandibular retrusion. The Class II population was divided into Class II due to a protrusive maxilla and Class II due to a retrusive mandible. The Lande Angle was used to determine if the maxilla was protrusive. Initially, if subjects had an ANB greater than 85 degrees and a Lande Angle greater than 91 degrees they were assigned to the CL II-P group. A Lande Angle of 91 degrees was initially chosen to identify maxillary protrusion as indicated in the 1974 Michigan Growth Study. However, when searching for subjects, a Lande Angle near 91 degrees was very common. Due to the common

finding of a Lande Angle equal to or slightly greater than 91 degrees, this study raised the Lande Angle requirement to be greater than or equal to 93 degrees for inclusion in the CL II-P group. The common finding of a Lande Angle near 91 degrees conflicts with the definition of maxillary protrusion using the Lande Angle in the 1974 Michigan Growth Study.

Yet another area of confliction when assigning subjects to Class II-P or Class II-R, was the overlapping of measurements defining CL II-P with the measurements defining CL II-R. For example, in some patients they would have a Lande Angle of over 93 degrees while also having an SNB angle less than 76 degrees. A Lande Angle more than 93 degrees is classified as maxillary protrusion, whereas an SNB less than 76 degrees is classified as mandibular retrusion. When potential research subjects presented with conflicting data such as the latter, they were eliminated from the study.

To determine maxillo-mandibular width ratios the distance between the following bilateral landmarks were measured; Infraorbital Foramen (IF), Maxillary Canine Root Apices (CRA), Greater Palatine Foramen (GPF), Maxillary First Molar Palatal Root Apex (MRA), Mandibular Canine Root Apex (CA), Mental Foramen (MF), Lingula (L), and the Alveolar Ridge at the Mandibular First Molar (AvRM). The latter landmarks were shown to be accurate for measuring widths of the maxilla and mandible (Stewart 2012) (Brewer 2012). Although these landmarks were shown to be reliable, some were easier to locate than others. The landmarks most easily identified were the CR and GPF, whereas the most difficult to identify were the lingula and infraorbital foramen. The

lingula and infraorbital foramen were sometimes difficult to identify because of potential asymmetry and irregularities at the specific points of the landmarks chosen for measurement. When slicing the cone beam image, often one of the bilateral landmarks did not coincide with the contralateral landmark. For example, the point of measurement for the infraorbital foramen was the nerve canal just before the inferior border of the canal became enclosed by bone at the zygomatic arch (Figure 1). Frequently, one canal was ideal for measurement, while the contralateral canal was not (Figure 2). The anatomic inconsistency of the infraorbital foramen may preclude it from being a reliable landmark. Similar issues were experienced when measuring the linear distances between the lingula as well. Surprisingly, the linear measurement between mandibular canine root apices was much more reproducible than the linear measurement between the maxillary canine root apices. Perhaps this canine discrepancy is due to the fact that mandibular canine root apices are generally closer in relation compared to maxillary canine root apices. Another explanation may be that anatomic structures in the maxilla such as the nasal septum and sinuses cause the maxillary canine root apices to be irregularly positioned or unclear.

Currently, cone beams are not taken on most orthodontic patients due to increased radiation exposure. As a result, most clinicians must determine skeletal transverse discrepancies in two dimensions. Furthermore, due to overlap of anatomic structures, these practitioners are relegated to posterior landmarks such as jugal point and antegonial notch. As progress is made with cone beam technology, radiation exposure

will decrease, thus allowing practitioners to determine skeletal discrepancies using three dimensions.

The results of this study make clear that measurements using both anterior and posterior landmarks are possible when using cone beam imaging. The consistency of linear measurements between landmarks was similar for all three groups. For the Class I group the order of consistency from greatest to least was; Alveolar Ridge at the Mandibular first Molar (AvRM), Greater Palatine Foramen (GPF), Mandibular Canine Root Apex (CR), Maxillary Canine Root Apex (CRA), Maxillary first Molar Palatal Root Apex (MRA), Mental Foramen (MF), Infraorbital Foramen (IF), and lastly Lingula (L). For the Class II-P group the order of consistency from greatest to least was; CR, GPF, MRA, MF, AvRM, CRA, L, and lastly IF. For the Class II-R group the order of consistency from greatest to least was CR, GPF, MF, L, AvRM, MRA, CRA, and lastly IF. The data suggests that there is no clear choice when determining if linear measurements between skeletal landmarks is more consistent than linear measurements between dental landmarks. Skeletal landmarks such as the greater palatine foramen proved to be more consistent than the dental landmarks like CRA. On the contrary, dental landmarks such as the mandibular canine root apices proved to be more consistent than the lingula. This is somewhat surprising when considering the prevalence of dental anomalies such as root dilacerations and morphologic anomalies. The data suggests that there may be just as many anomalies skeletally, whether the cause is exostosis, asymmetry, or malformation.

This study found no relation between maxillo-mandibular anteroposterior discrepancy and transverse maxillo-mandibular discrepancies. Transverse widths of the maxilla and mandible were compared using the linear measurements between the aforementioned bilateral landmarks. By establishing a maxillo-mandibular width ratio, a more accurate determination of transverse discrepancy can be shown. For the Class I population, the order from the most to least consistent maxillo-mandibular width ratio was; GPF/L, MRA/L, GPF/AvRM, CRA/MF, MRA/AvRM, IF/MF, CRA/CR, and lastly IF/CR. For the Class II-P population, the order from the most to least consistent maxillo-mandibular width ratio was; GPF/L, MRA/L, GPF/AvRM, MRA/AvRM, CRA/MF, IF/MF, CRA/CR, and lastly IF/CR. For the Class II-R population, the order from the most to least consistent maxillo-mandibular width ratio was; GPF/L, MRA/L, GPF/AvRM, MRA/AvRM, CRA/MF, IF/MF, CRA/CR, and lastly IF/CR. Both the Student's t Test and one way ANOVAS showed that there was no significant difference in maxillo-mandibular width ratios between all three groups. Interestingly, all groups shared very similar ratios for each category (Figures 3A-3H). The most consistent ratio for all three groups was GPF/L. This result was surprising since the inter-lingula distance proved to be one of the most inconsistent transverse measurements. Furthermore, two of the least consistent ratios were IF/CR and CRA/CR. This result also was unexpected since the inter-CR distance proved to be one of the most reliable measurements. Overall, the posterior maxillo-mandibular ratios proved to be more consistent than the anterior ratios. The reason for the posterior ratios being more accurate than the anterior ratios is unclear, but may be attributed to thicker bone in the posterior than the anterior. Thus,

the posterior landmarks may be less susceptible to environmental effects compared to the anterior landmarks.

The orthodontic community has yet to confirm if maxillo-mandibular anteroposterior discrepancies correlate with maxillo-mandibular transverse discrepancies. Previous studies have concluded that arch width discrepancies exist or that maxillo-mandibular transverse discrepancies exist among Class I and Class II populations (da Silva 2008) (Varella 1998) (Franchi 2005) (Bishara 1996) (Tancan 2005) (Lux 2003) (Basaran 2008). However, the latter studies did not make measurements using cone beam images. These studies used traditional PA cephalographs, models, or photocopies of models to diagnose the width discrepancies. This study contradicts the findings of studies supporting maxillo-mandibular transverse discrepancies among Class I and Class II populations. This study supports the findings of (Ball 2010) (Sayin 2004) who found that no skeletal transverse discrepancies occur between Class I and Class II populations. Furthermore, this study subdivided the Class II population into Class II-P and Class II-R, and found no significant differences in maxillo-mandibular width discrepancies when compared to each other and the Class I population.

The hope of this study was to establish maxillo-mandibular width ratio norms to classify patients into Class I, Class II-P, or Class II-R categories. If maxillo-mandibular ratio norms were established for these Classes, this would be one more tool to help in the diagnostic process. Similar to skeletal measurements like ANB, a normalized maxillo-mandibular ratio could reveal in more accuracy the skeletal classification of an

individual. Unfortunately, the maxillo-mandibular width ratios were too similar for individual Class norms to be established. The fact that the ratios were similar among the Class I, Class II-P, and Class II-R indicates that anteroposterior positioning of the jaws has no effect on the width of one arch compared to the other. For example, if the CL II-P maxilla was found to be wider than normal, then this study's data indicates that the mandibular arch would have a proportional increase in arch width as well.

Although the data failed to support the hypothesis that the maxillo-mandibular anterior and posterior width ratios are different in a Class I population compared to a Class II population regardless if the Class II is due to a maxillary excess or mandibular deficiency, the results of the study may prove useful in future studies. This study established maxillo-mandibular width ratio norms using multiple landmarks. For example, the average maxillo-mandibular width ratio IF/MF was calculated to be 1.11. Knowing the normalized ratio, one can determine maxillo-mandibular width ratio discrepancies by comparing data to the normalized ratio. If the maxillo-mandibular width ratio measured by the provider was less than the norm, then the discrepancy would be due to either a narrow maxilla or a wide mandible. Conversely, If the maxillo-mandibular width ratio measured by the provider was more than the norm, then the discrepancy would be due to either a wide maxilla or a narrow mandible. A potential application for new research would be to compare maxillo-mandibular width ratios in populations with crossbites. By comparing the width ratios in the crossbite population to the normalized skeletal maxillo-mandibular width ratios, the examiner can determine if the crossbite is skeletal or dental in nature. A method for determining the cause of a

crossbite would be extremely useful in treatment planning. If a skeletal maxillo-mandibular width ratio discrepancy was found to be caused by a narrow maxilla, then the practitioner could use a palatal expander as part of the treatment. On the contrary, if the maxillo-mandibular width ratio was similar to the established norm, then more than likely the discrepancy would be caused by dental discrepancies, and the crossbite could be corrected with dental movements.

Figure 1- Symmetric Infraorbital Foramen

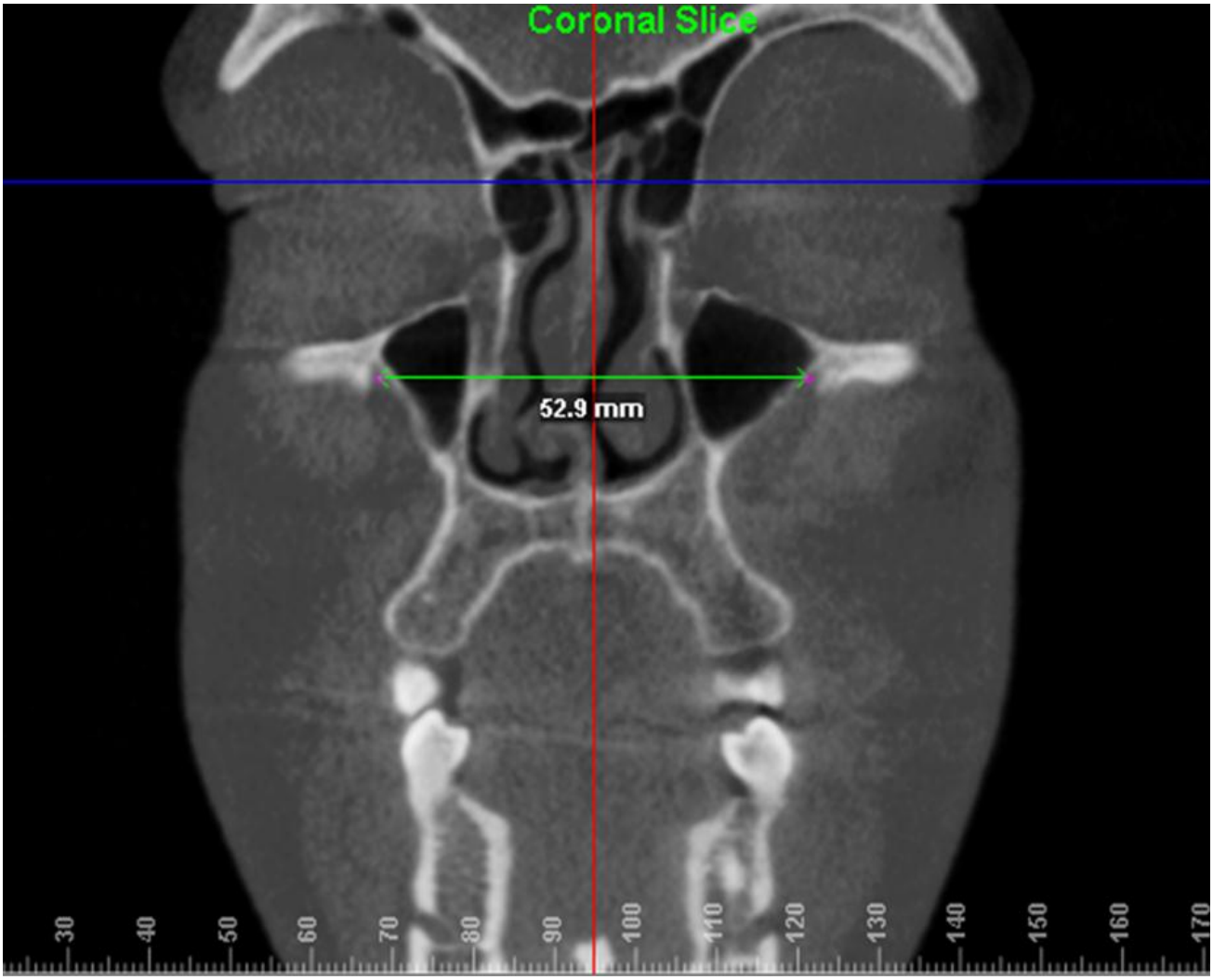


Figure 2- Asymmetric Infraorbital Foramen

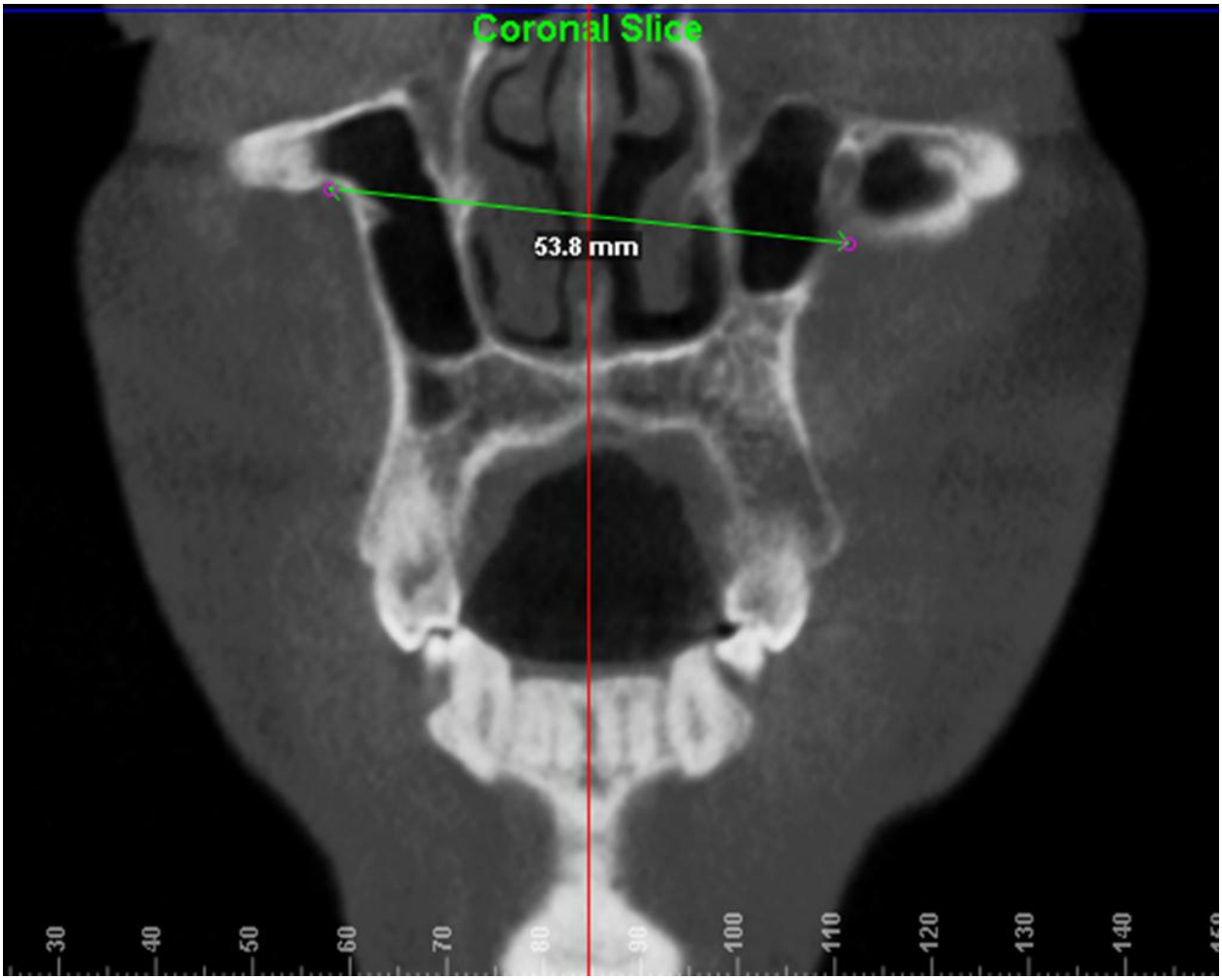


Figure 3A- IF:MF

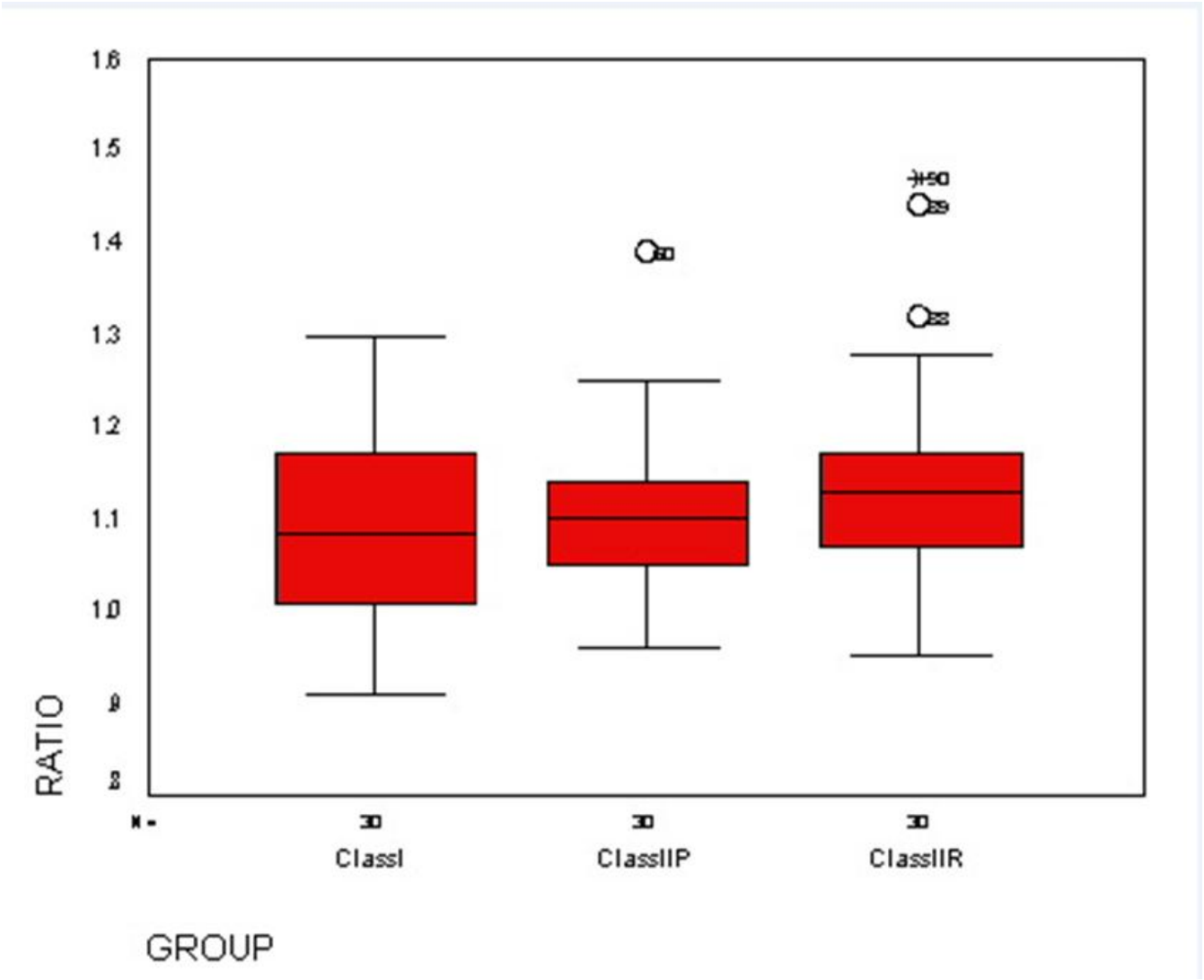


Figure 3B- IF:CR

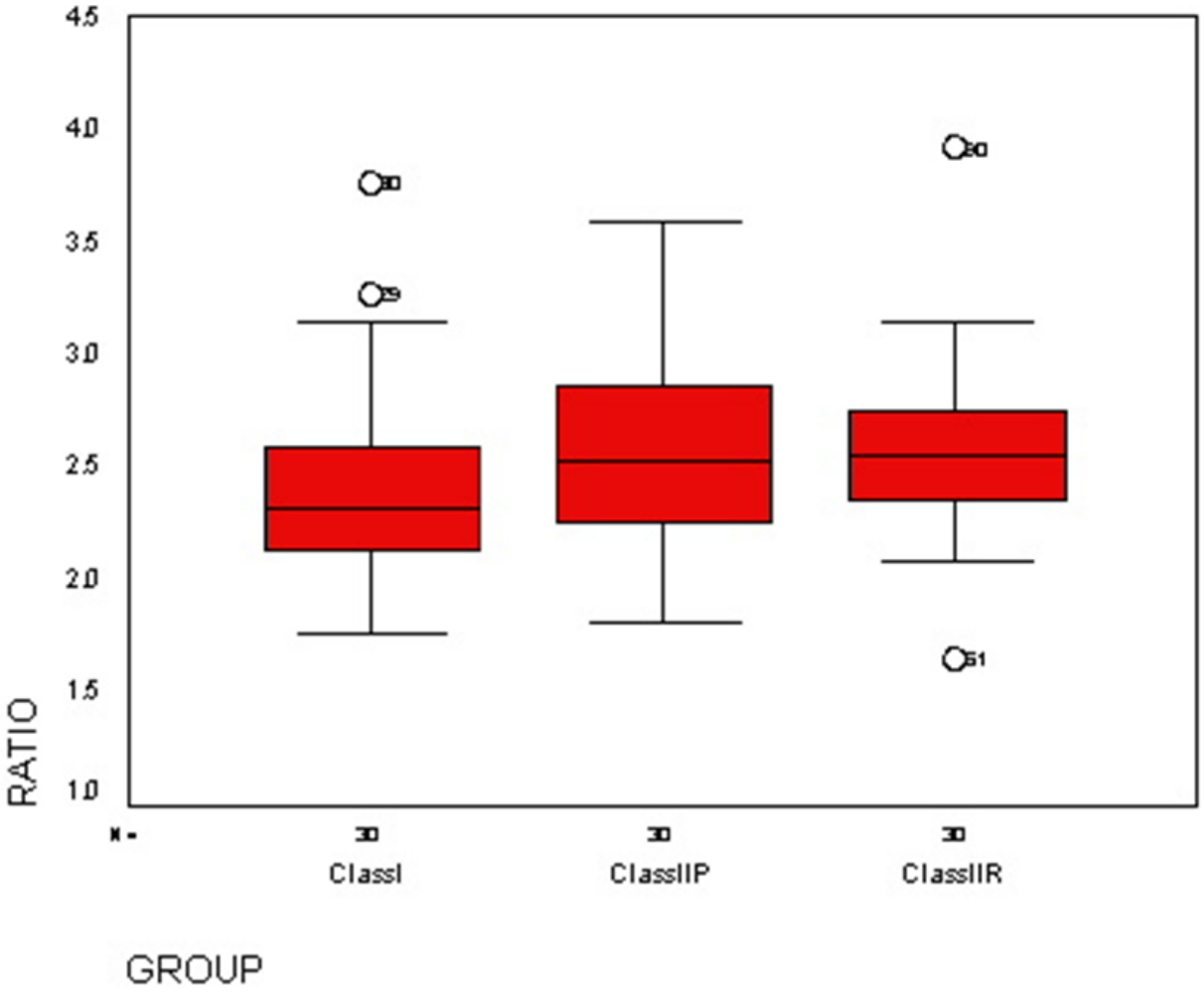
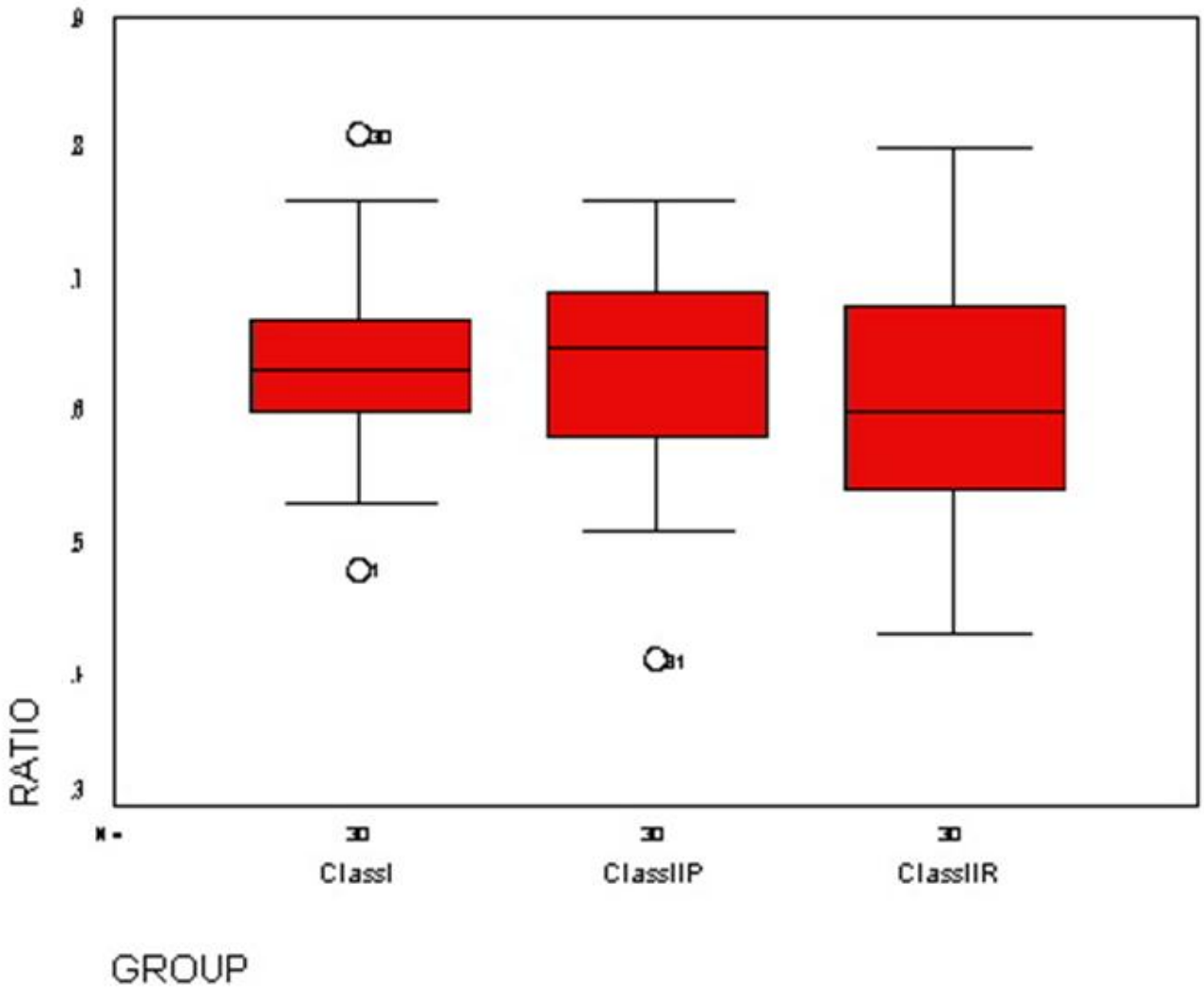


Figure 3C- CRA:MF



.***Figure 3D- CRA:CR***

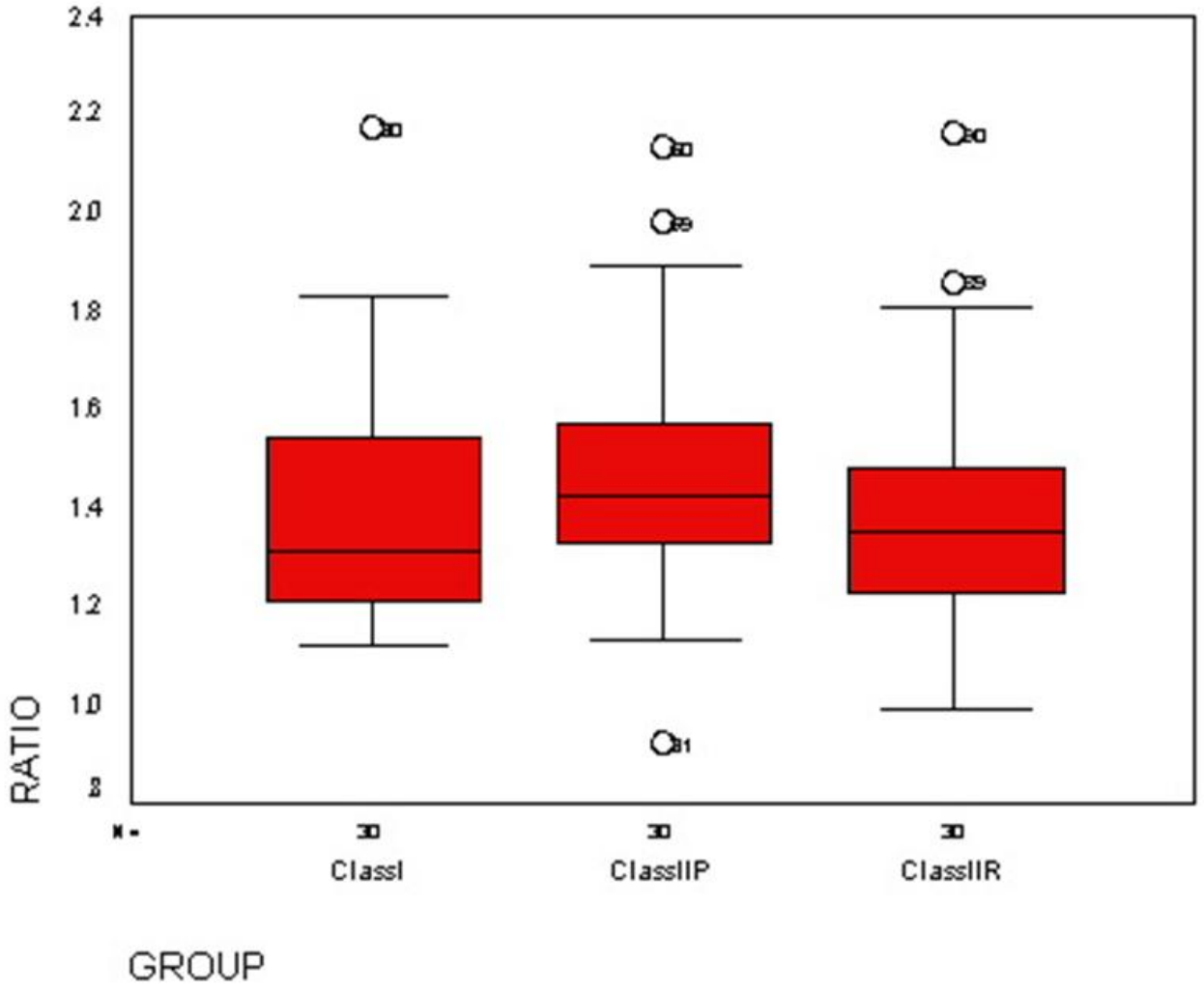


Figure 3E- GPF:L

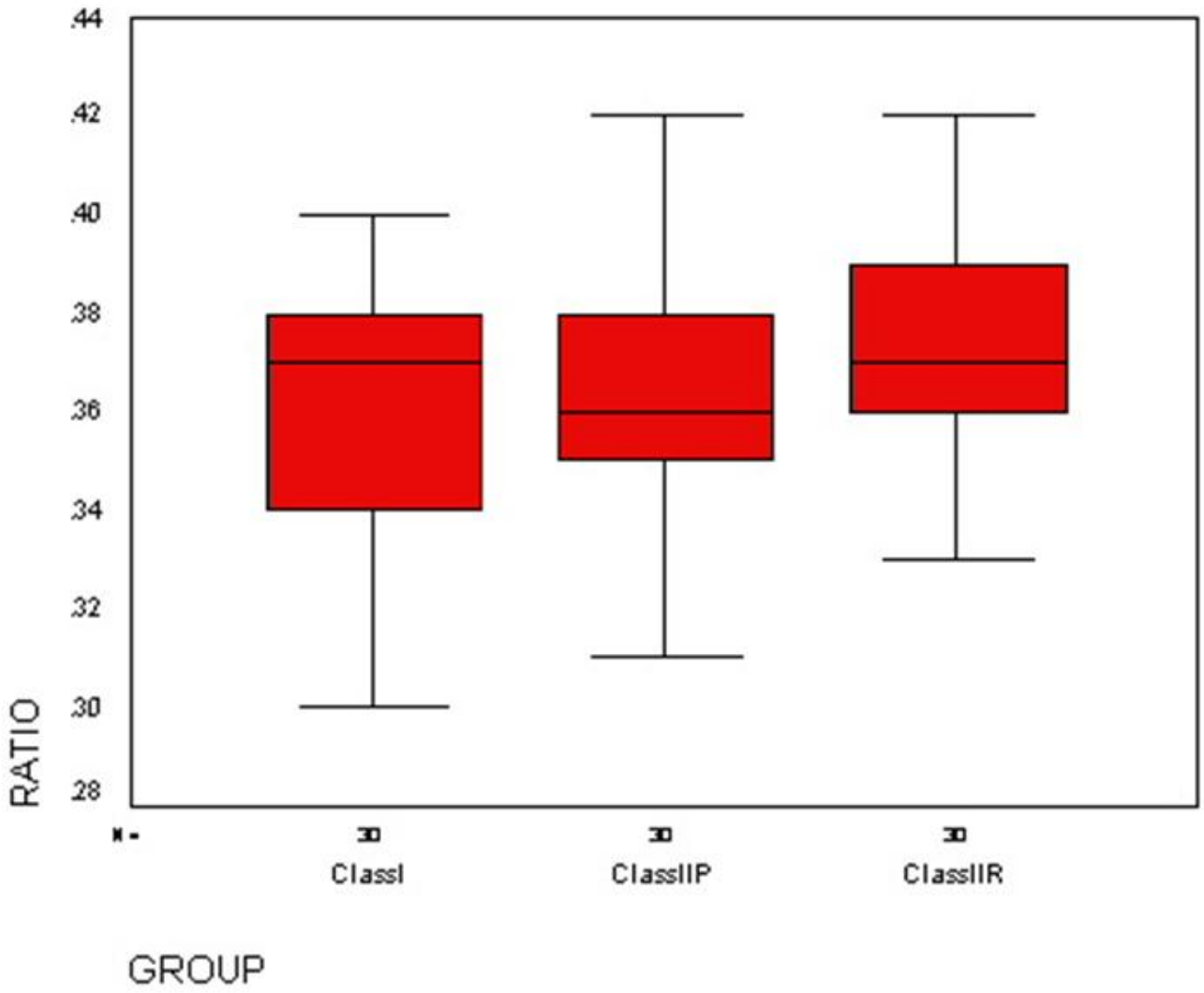


Figure 3F- GPF:AvRM

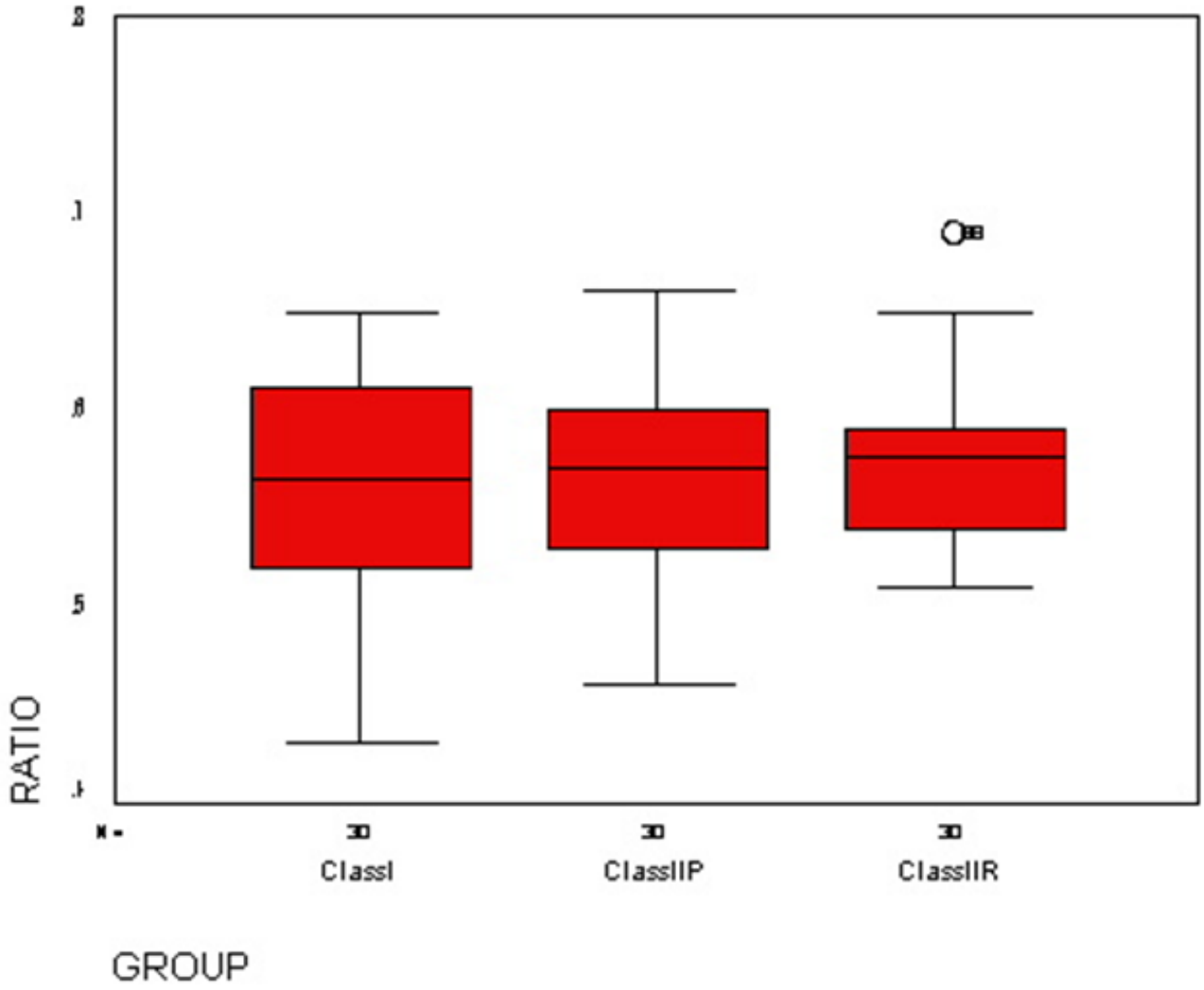


Figure 3G- MRA:L

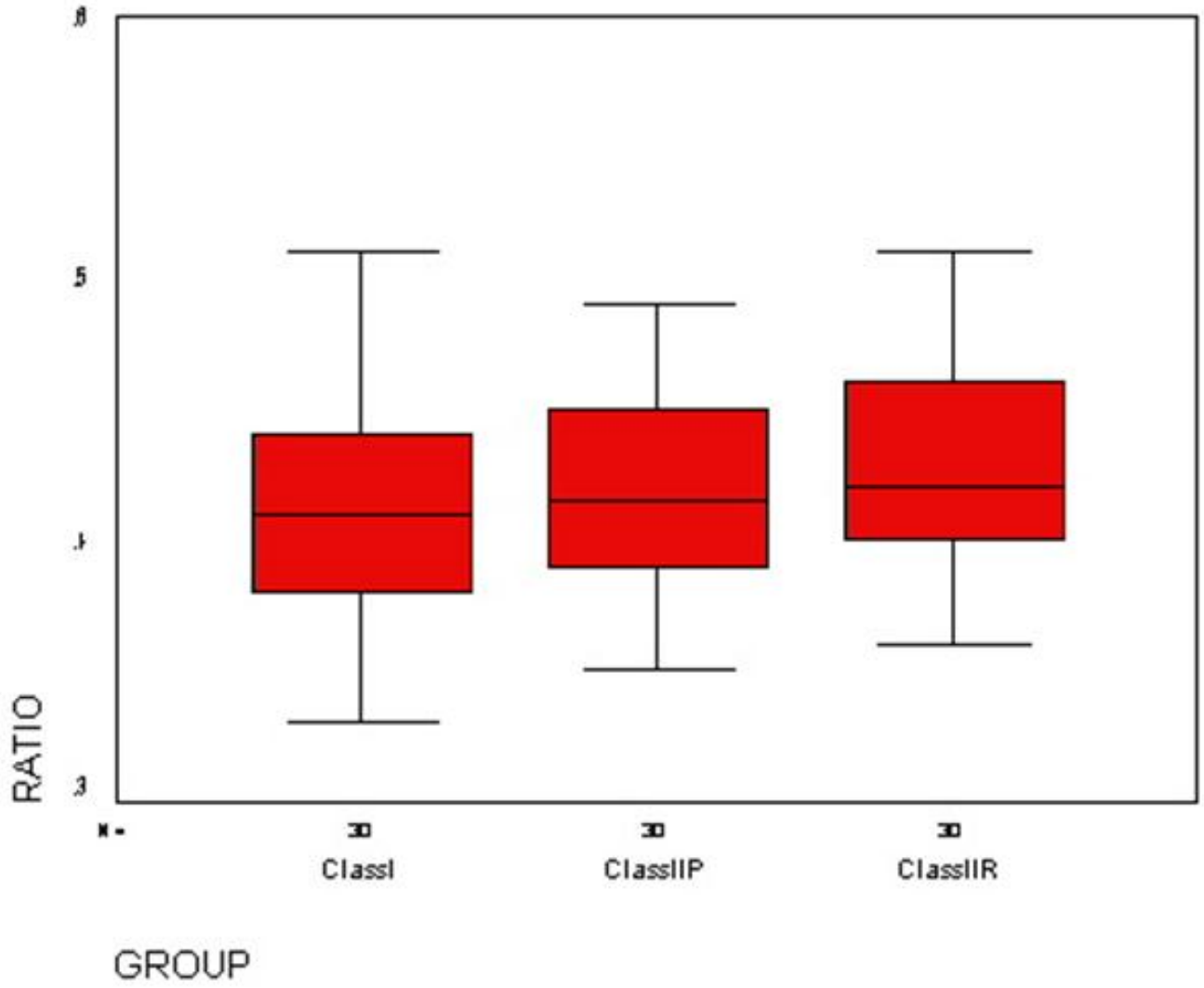
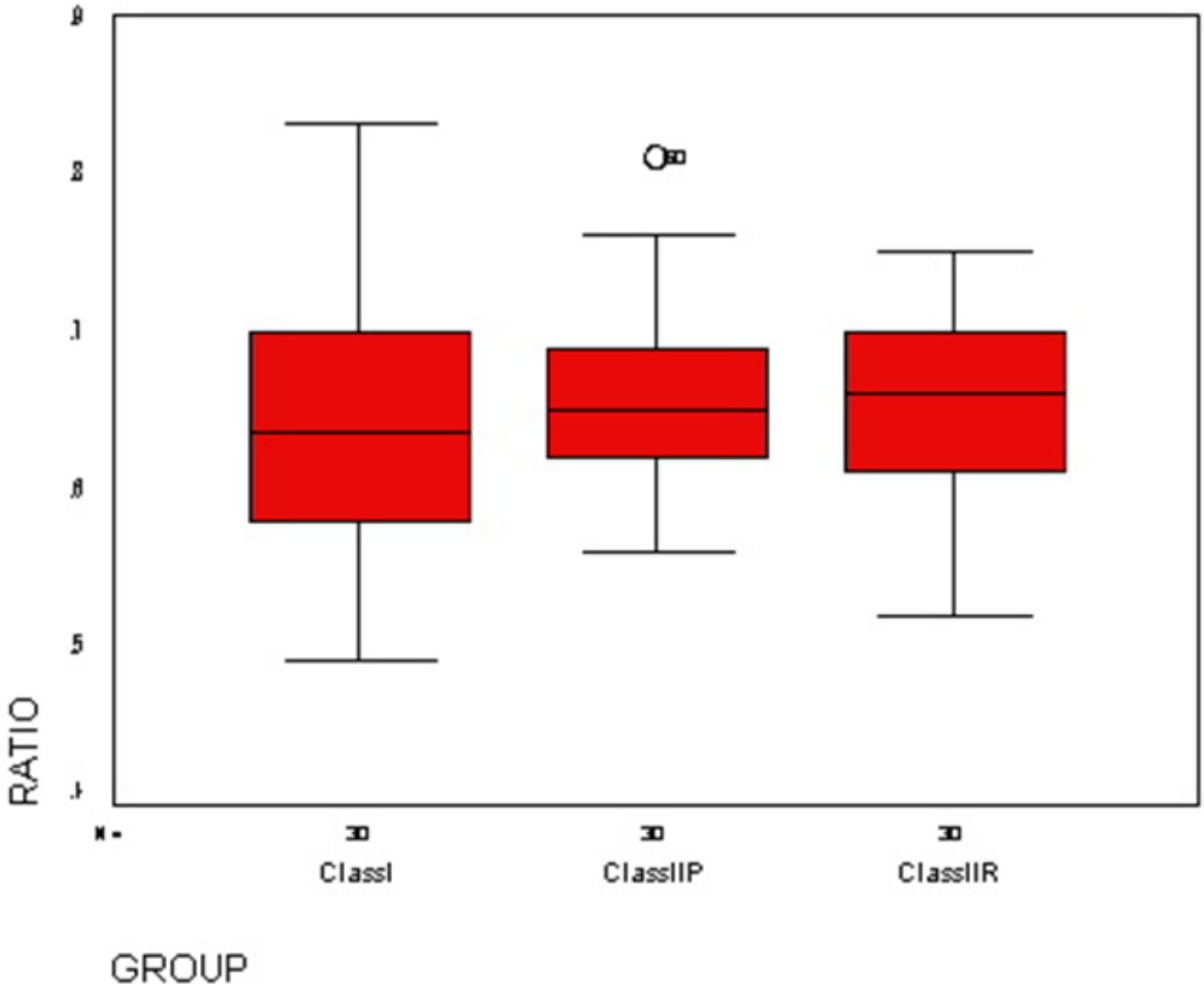


Figure 3H- MRA:AvRM



VI. Conclusion

Within the parameters of this study, the following conclusions can be drawn:

1. The anterior maxillo-mandibular width ratio for Class I subjects, Class II due to a protrusive maxilla subjects, and Class II due to a retrusive mandible subjects are not statistically different.

2. The posterior maxillo-mandibular width ratio for Class I subjects, Class II due to a protrusive maxilla subjects, and Class II due to a retrusive mandible subjects are not statistically different.

3. The consistency of linear measurements between landmarks was similar for all three groups. For the Class I group the order of consistency from greatest to least was; Alveolar Ridge at the Mandibular first Molar (AvRM), Greater Palatine Foramen (GPF), Mandibular Canine Root Apex (CR), Maxillary Canine Root Apex (CRA), Maxillary first Molar Palatal Root Apex (MRA), Mental Foramen (MF), Infraorbital Foramen (IF), and lastly Lingula (L). For the Class II-P group the order of consistency from greatest to least was; CR, GPF, MRA, MF, AvRM, CRA, L, and lastly IF. For the Class II-R group the order of consistency from greatest to least was CR, GPF, MF, L, AvRM, MRA, CRA, and lastly IF. The data suggests that there is no clear choice when determining if linear measurements between skeletal landmarks is more consistent than linear measurements between dental landmarks.

4. For the Class I population, the order from the most to least consistent maxillo-mandibular width ratio was; GPF/L, MRA/L, GPF/AvRM, CRA/MF, MRA/AvRM, IF/MF, CRA/CR, and lastly IF/CR. For the Class II-P population, the order from the most to least consistent maxillo-mandibular width ratio was; GPF/L, MRA/L, GPF/AvRM, MRA/AvRM, CRA/MF, IF/MF, CRA/CR, and lastly IF/CR. For the Class II-R population, the order from the most to least consistent maxillo-mandibular width ratio was; GPF/L, MRA/L, GPF/AvRM, MRA/AvRM, CRA/MF, IF/MF, CRA/CR, and lastly IF/CR.

5. The most consistent maxillo-mandibular width ratio for all three groups was GPF/L. Two of the least consistent maxillo-mandibular width ratios were IF/CR and CRA/CR.

6. Overall, posterior landmarks used to establish maxillo-mandibular width ratios are more consistent than anterior landmarks.

Literature Cited

1. Athanasiou, A. E., Droschl, H., & Bosch, C. (1992). Data and patterns of transverse dentofacial structure of 6-to 15-year-old children: a posteroanterior cephalometric study. American Journal of Orthodontics and Dentofacial Orthopedics, 101(5), 465-471.
2. Athanasiou, A. E., Miethke, R. R., & Van Der Meij, A. J. W. (1999). Random errors in localization of landmarks in postero-anterior cephalograms. Journal of Orthodontics, 26(4), 273-284.
3. Ball, R. L., Miner, R. M., Will, L. A., & Arai, K. (2010). Comparison of dental and apical base arch forms in Class II Division 1 and Class I malocclusions. American Journal of Orthodontics and Dentofacial Orthopedics, 138(1), 41-50.
4. Basaran, G., Hamamci, N., & Hamamci, O. (2008). Comparison of dental arch widths in different types of malocclusions. Journal of Orthodontics, 9, 20-28.
5. Betts, N. J., Vanarsdall, R. L., Barber, H. D., Higgins-Barber, K., & Fonseca, R. J. (1995). Diagnosis and treatment of transverse maxillary deficiency. International Journal of Adult Orthodontics and Orthognathic Surgery, 10(2), 75-96.
6. Bishara, S. E., Bayati, P., & Jakobsen, J. R. (1996). Longitudinal comparisons of dental arch changes in normal and untreated Class II, Division 1 subjects and their clinical implications. American journal of orthodontics and dentofacial orthopedics, 110(5), 483-489.
7. Brewer, B. Maxillary transverse comparison of skeletal class I and class III patient populations using cone beam computed tomography. San Antonio, 2012 Print
8. Cortella, S., Shofer, F. S., & Ghafari, J. (1997). Transverse development of the jaws: norms for the posteroanterior cephalometric analysis. American journal of orthodontics and dentofacial orthopedics, 112(5), 519-522.
9. da Silva Filho, O. G., Ferrari Júnior, F. M., & Okada Ozawa, T. (2008). Dental arch dimensions in Class II division 1 malocclusions with mandibular deficiency. The Angle Orthodontist, 78(3), 466-474.
10. de Oliveira, A. E. F., Cevidanes, L. H. S., Phillips, C., Motta, A., Burke, B., & Tyndall, D. (2009). Observer reliability of three-dimensional cephalometric landmark identification on cone-beam CT. Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics, 107(2), 256.
11. Franchi, L., & Baccetti, T. (2005). Transverse maxillary deficiency in Class II and Class III malocclusions: a cephalometric and morphometric study on postero-anterior films. Orthodontics & Craniofacial Research, 8(1), 21-28.
12. Ghafari, J., Cater, P. E., & Shofer, F. S. (1995). Effect of film-object distance on posteroanterior cephalometric measurements: suggestions for standardized

cephalometric methods. American Journal of Orthodontics and Dentofacial Orthopedics, 108(1), 30-37.
13. Hsiao, T. H., Chang, H. P., & Liu, K. M. (1997). A method of magnification correction for posteroanterior radiographic cephalometry. The Angle Orthodontist, 67(2), 137-142.
14. Huth, J., Staley, R. N., Jacobs, R., Bigelow, H., & Jakobsen, J. (2007). Arch widths in Class II-2 adults compared to adults with Class II-1 and normal occlusion. The Angle Orthodontist, 77(5), 837-844.
15. Jacobs, J. D., Bell, W. H., Williams, C. E., & Kennedy, J. W. (1980). Control of the transverse dimension with surgery and orthodontics. American Journal of Orthodontics, 77(3), 284-306.
16. Jacobson, Alexander. Radiographic Cephalometry. Carol Stream: Quintessence, 1995. Print
17. Kahl-Nieke, B., Fischbach, H., & Schwarze, C. W. (1996). Treatment and postretention changes in dental arch width dimensions—a long-term evaluation of influencing cofactors. American journal of orthodontics and dentofacial orthopedics, 109(4), 368-378.
18. Lundström, A., Lundström, F., Lebret, L. M. L., & Moorrees, C. F. A. (1995). Natural head position and natural head orientation: basic considerations in cephalometric analysis and research. The European Journal of Orthodontics, 17(2), 111-120.
19. Lux, C. J., Conradt, C., Burden, D., & Komposch, G. (2003). Dental arch widths and mandibular-maxillary base widths in Class II malocclusions between early mixed and permanent dentitions. The Angle Orthodontist, 73(6), 674-685.
20. Lux, C. J., Conradt, C., Burden, D., & Komposch, G. (2004). Transverse development of the craniofacial skeleton and dentition between 7 and 15 years of age—a longitudinal postero-anterior cephalometric study. The European Journal of Orthodontics, 26(1), 31-42.
21. Marshall, S. D., Southard, K. A., & Southard, T. E. (2005, September). Early transverse treatment. In Seminars in Orthodontics (Vol. 11, No. 3, pp. 130-139). WB Saunders.
22. Moorrees, C. F. A., & Jacobson, A. (1995). Radiographic Cephalometry, From Basics to Videoimaging. Radiographic cephalometry: from basics to videoimaging.
23. Northway, W. M., & Meade Jr, J. B. (1997). Surgically assisted rapid maxillary expansion: a comparison of technique, response, and stability. The Angle Orthodontist, 67(4), 309-320.
24. Pancherz, H., & Fackel, U. (1990). The skeletofacial growth pattern pre-and post-dentofacial orthopaedics. A long-term study of Class II malocclusions treated with the Herbst appliance. The European Journal of Orthodontics, 12(2), 209-218.

25. Periago, D. R., Scarfe, W. C., Moshiri, M., Scheetz, J. P., Silveira, A. M., & Farman, A. G. (2008). Linear accuracy and reliability of cone beam CT derived 3-dimensional images constructed using an orthodontic volumetric rendering program. The Angle orthodontist, 78(3), 387-395.
26. Proffit, W. R., Fields Jr, H. W., & Sarver, D. M. (2013). Contemporary orthodontics 5th ed. St. Louis: Mosby, 2013. Print
27. Proffit, W. R., & White, R. P. (1990). Who needs surgical-orthodontic treatment. Int J Adult Orthodon Orthognath Surg, 5(2), 81-9.
28. Ricketts, R. M. (1982). Orthodontic diagnosis and planning: their roles in preventive and rehabilitative dentistry (Vol. 2). Rocky Mountain/Orthodontics.
29. Riolo, M. L., Moyers, R. E.,McNamara, J. A., Hunter, S. W. An atlas of craniofacial growth (vol. 2). Ann Arbor: University of Michigan, 1974. Print
30. Rose, J. M., Sadowsky, C., BeGole, E. A., & Moles, R. (1994). Mandibular skeletal and dental asymmetry in Class II subdivision malocclusions. American Journal of Orthodontics and Dentofacial Orthopedics, 105(5), 489-495.
31. Sampson, P., Little, R. M., Årtun, J., & Shapiro, P. A. (1995). Long-term changes in arch form after orthodontic treatment and retention. American Journal of Orthodontics and Dentofacial Orthopedics, 107(5), 518-530.
32. Sayin, M. O., & Turkkahraman, H. (2004). Comparison of dental arch and alveolar widths of patients with Class II, division 1 malocclusion and subjects with Class I ideal occlusion. The Angle Orthodontist, 74(3), 356-360.
33. Slaj, Martina, Spalj, Stjepan, Pavlin, Dubravko, Illes, Davor, Slaj, Mladen. Dental arch forms in dentoalveolar Class I, II and III. Angle Orthodontist; Sep 2010, Vol. 80 Issue 5, p919-924, 6p.
34. Snodell, S. F., Nanda, R. S., & Currier, G. F. (1993). A longitudinal cephalometric study of transverse and vertical craniofacial growth. American Journal of Orthodontics and Dentofacial Orthopedics, 104(5), 471-483.
35. Stewart, M. A comparison of mandibular transverse dimensions of a class I normal and class II patient population using anterior to posterior measurement ratios. San Antonio, 2012 Print
36. Uysal, T., Memili, B., Usumez, S., & Sari, Z. (2005). Dental and alveolar arch widths in normal occlusion, Class II division 1 and Class II division 2. The Angle Orthodontist, 75(6), 941-947.
37. Varrela, J. (1998). Early developmental traits in Class II malocclusion. Acta Odontologica, 56(6), 375-377.

Appendix A Raw Data

Class I Group (Subjects)

Gender	Age	ANB	SNA	SNB	Lande Angle	Facial Angle	
F	23.08	4	77	73.2	91.1	88.1	MAN II-01
M	22.5	2	85.4	83.5	95.9	95	MAN II-02
F	14.17	3	85.5	82.5	93.2	91.7	MAN II-03
M	21.75	3.9	83	79.1	96.6	93	MAN II-04
M	24.58	2.5	82.1	79.6	93.9	92.2	MAN II-05
F	21.08	3.7	85.4	81.8	93.7	92.5	MAN II-06
F	19.42	3.6	83.7	80.1	92.8	91.4	MAN II-07
M	28.25	3.4	84.4	81	93.8	91.2	MAN II-08
F	14	2.9	81.7	78.8	90.3	87.3	MAN II-09
M	32.58	2.1	82.7	79.8	92	91.6	MAN II-10
M	26.17	2.4	77.6	75.2	89.7	88.2	MAN II-11
F	26.08	3.7	84.8	81.1	97.7	93.9	MAN II-12
M	28.75	3.9	85	81.1	93.5	89.7	MAN II-13
F	15.91	3.1	82.9	79.8	92.4	89.4	MAN II-14
F	16.42	2.2	83	80.8	89.1	87.9	MAN II-15
M	15.75	3.4	83.3	79.9	91.8	90.5	MAN II-16
M	29.33	2	76.5	74.5	86.1	85.2	MAN II-17
F	23.58	3.9	86.5	82.5	97.1	92.2	MAN II-18
M	38.42	3	84	81	92.8	90	MAN II-19
M	23.17	3.2	87.7	84.5	93.3	91.7	MAN II-20
M	47.83	3.7	79	75.3	91.5	89.4	MAN II-21

F	14	3.5	77.7	74.2	86.3	82.9	MAN II-22
F	26.5	3.3	83.1	79.8	92.1	89.6	MAN II-23
F	26.08	3.8	84.3	80.5	95.2	91.9	MAN II-24
M	40.83	2.7	87.5	84.5	92	89.5	MAN II-25
F	14.91	2.5	83.2	80.7	94.1	91.7	MAN II-26
F	15.58	3	82.9	79.8	97	95.1	MAN II-27
F	27.91	2.6	80.5	79.4	94	90.7	MAN II-28
F	22.91	2.1	84.1	82	96.8	95.4	MAN II-29
F	16.91	3.6	80.5	76.8	93.4	90.7	MAN II-30
Mean	23.94833	3.09	82.83333	79.76	92.97333333	90.65333333	
SD	8.237769	0.646129	2.947042	2.906663	2.856684035	2.755525275	

Appendix I. Statistical Comparisons of inclusive characteristics in Class II due to Maxillary Protrusion and Class I Groups

	Class II Max Protrusion Group (n=30)			
Variables	Mean	SD	Min	Max
Age	23.9	8.2	14.0	47.0
ANB	3.1	0.6	2.0	4.0
SNA	82.8	2.9	76.5	87.7
SNB	79.8	2.9	73.2	84.5
LA	93.0	2.9	86.1	97.7
FA	90.7	2.8	82.9	95.4

SD indicates standard deviation; Min, minimum; Max, maximum; NS, not significant

ANB= A point-Nasion-B point angle; SNA= Sella-Nasion-A point angle; SNB=Sella-Nasion-B point angle; LA=Porion-Orbitale-Nasion-A Point; FA=Nasion-Pogonion-Porion-Orbitale

Class II Due to Maxillary Protrusion (Subjects)

Gender	Age	ANB	SNA	SNB	Lande Angle	Facial Angle		
M	17	8	88.3	80.2	99.2	90.6	Mx	PROG-1
F	38	6	88.9	83.2	95.6	89.9	mx	PROG-2
F	17	6.9	86	79.1	93.7	86.7	mx	PROG-3
M	20	6.3	86.9	80.5	95.8	89.1	mx	PROG-4
M	24	5.3	84.3	79.1	93.1	89.2	mx	PROG-5
M	44	10.1	89.1	79	97.4	87.7	mx	PROG-6
F	19	6.8	85.8	78.9	98.1	92.2	mx	PROG-7
M	31	8.1	84.8	76.7	95.1	88.1	mx	PROG-8
F	15	5.5	82.3	76.8	97.3	92	mx	PROG-9
F	16	5.2	84.8	79.8	97.5	91.9	mx	PROG-10
M	35	7.9	87.5	79.6	97.5	92.2	mx	PROG-11
M	24	5.2	83.6	78.6	94.6	91.3	mx	PROG-12
M	20	5.1	86.4	81.3	95.5	91.1	mx	PROG-13
M	27	6.9	85.1	78.2	98	90.1	mx	PROG-14
F	41	5.3	85.4	80.5	96.8	94.1	mx	PROG-15
M	27	8.5	86.9	87.4	99	91	mx	PROG-16
M	40	5.4	86.9	81.5	93.4	89.4	mx	PROG-17
M	20	6	88.1	82.1	95	92.3	mx	PROG-18
M	23	5.1	85.5	80.4	95.8	90.7	mx	PROG-19
F	24	5.9	83.2	77.3	99.8	95.5	mx	PROG-20
F	14	5.3	86.3	80.9	94.5	88.5	mx	PROG-21
M	18	6.5	83.6	77.1	94.7	89	mx	PROG-22
M	16	6.3	85.4	79.7	96.4	91	mx	PROG-23
M	33	5.3	84.4	79.4	94.5	89.2	mx	PROG-24
F	45	8.2	91	82.9	97.5	89.3	mx	PROG-25
F	32	6.7	94.5	87.8	100.8	94.7	mx	PROG-26

M	18	9.4	101	91.6	103.6	93.4	mx	PROG-27
F	27	5.9	84.5	78.6	93.7	88.1	mx	PROG-28
M	17	5.5	87.9	82.4	93.1	88	mx	PROG-29
M	26	5.6	85.2	79.5	94.4	90.1	mx	PROG-30
Mean	25.6	6.473333	86.78667	80.67	96.38	90.5466667		
SD	9.197	1.362537	3.648498	3.320173	2.470013263	2.14712853		

Appendix I. Statistical Comparisons of inclusive characteristics in Class II due to Maxillary Protrusion and Class I Groups

	Class II Max Protrusion Group (n=30)			
Variables	Mean	SD	Min	Max
Age	25.6	9.2	14.0	44.0
ANB	6.5	1.4	5.1	10.1
SNA	86.8	3.6	83.2	101.0
SNB	80.7	3.3	76.7	91.6
LA	96.4	2.5	93.1	103.6
FA	90.5	2.1	86.7	95.5

SD indicates standard deviation; Min, minimum; Max, maximum; NS, not significant

ANB= A point-Nasion-B point angle; SNA= Sella-Nasion-A point angle; SNB=Sella-Nasion-B point angle; LA=Porion-Orbitale-Nasion-A Point; FA=Nasion-Pogonion-Porion-Orbitale

Class II Due to Mandibular Retrusion (Subjects)

Gender	Age	ANB	SNA	SNB	Lande Angle	Facial Angle	
F	35	6	80.3	74.3	88.1	85.3	RET- 1
F	25	8.3	82.4	74.1	93	85.2	RET- 2
M	16	9	81.4	72.4	91.2	83.6	RET- 3
F	20	5.5	80.7	75.2	92.3	89	RET- 4
F	17	6.9	77.3	70.4	88.1	82.9	RET- 5
F	23	5.3	76.8	72	87.6	85.2	RET- 6
F	27	6	74.7	68.7	93	87.6	RET- 7
F	29	8	78.7	70.7	89	82	RET- 8
M	25	7	82.1	75	92	85.9	RET- 9
F	21	7.3	78.1	70.8	88.6	82.9	RET- 10
F	15	6.3	79.2	72.9	92.2	86.5	RET- 11
F	35	5.2	78	72.8	88.4	84.3	RET- 12
F	33	10.8	81.8	71	92.8	85.4	RET- 13
F	31	6.4	80.6	74.2	92.7	89.3	RET- 14
M	28	10.1	84	73.8	93	83.4	RET- 15
F	15	8.7	83.8	76	91	82.8	RET- 16
F	14	5.5	80	74.6	91.5	86.3	RET- 17
F	15	5.6	78	72.4	87.8	83.1	RET- 18
F	24	6	82	76	93	87.8	RET- 19
M	48	8.4	82.8	74.4	91.3	82.9	RET- 20
F	25	5.2	82	75.9	88.9	83.6	RET- 21
F	15	5.2	80.5	75	88.1	82.1	RET- 22
M	16	7.9	84	75.9	90.9	83.9	RET- 23
F	40	6.8	78.2	71.4	84	79.3	RET- 24
F	16	5.1	77.1	72.1	88.9	84.2	RET- 25
F	16	6.3	72.4	66	85.8	78.7	RET- 26
M	17	9.5	80	70.5	91.7	82.3	RET- 27
M	30	8.2	79.9	71.7	90.5	81.1	RET- 28
M	17	7	83.1	76	91.4	85.3	RET- 29
F	26	5.1	81.4	75.9	92.9	89.2	RET- 30
Mean	23.8	6.953333	80.04333	73.07	90.32333333	84.37	
SD	8.607935	1.605966	2.750133	2.462708	2.391318109	2.64303248	

Appendix I. Statistical Comparisons of inclusive characteristics in Class II due to Mandibular Retrusion and Class I Groups

	Class II Man Retrusion Group (n=30)			
Variables	Mean	SD	Min	Max
Age	23.8	8.6	14.0	40.0
ANB	7.0	1.6	5.1	10.1
SNA	80.0	2.8	72.4	84.0
SNB	73.1	2.5	66.0	75.9
LA	90.3	2.4	84.0	93.0
FA	84.4	2.6	78.7	90.2

SD indicates standard deviation; Min, minimum; Max, maximum; NS, not significant

ANB= A point-Nasion-B point angle; SNA= Sella-Nasion-A point angle; SNB=Sella-Nasion-B point angle; LA=Porion-Orbitale-Nasion-A Point; FA=Nasion-Pogonion-Porion-Orbitale

CL I PATIENTS (1-30)

		Timepoint 1	Timepoint 2	Timepoint 3	Mean	SD
MAN II-01	IF-IF	43.8	43.8	44.4	44.00	0.35
	CRA-CRA	26.7	26.7	26.7	26.70	0.00
	GPF-GPF	26.7	26.7	26.2	26.53	0.29
	MRA-MRA	26.3	26.3	26.7	26.43	0.23
	CR-CR	17	17.3	17.8	17.37	0.40
	MF-MF	44.1	43.9	43.6	43.87	0.25
	L-L	80	81	80	80.33	0.58
	AvRM-AvRM	48	47.7	47.3	47.67	0.35
MAN II-02	IF-IF	49.7	48.2	49.3	49.07	0.78
	CRA-CRA	28.4	29.5	30.9	29.60	1.25
	GPF-GPF	28.6	29	28.7	28.77	0.21
	MRA-MRA	32.2	31.1	31.3	31.53	0.59
	CR-CR	25.1	24.8	25.3	25.07	0.25
	MF-MF	45.8	46.1	45.8	45.90	0.17
	L-L	82.3	82.9	83.2	82.80	0.46
	AvRM-AvRM	56.3	55.1	54.9	55.43	0.76
MAN II- 03	IF-IF	43.8	44.8	44.5	44.37	0.51
	CRA-CRA	24.1	24.8	24.6	24.50	0.36
	GPF-GPF	26.7	26	26.9	26.53	0.47
	MRA-MRA	28.8	27.6	28.3	28.23	0.60
	CR-CR	20.9	20.9	20.6	20.80	0.17
	MF-MF	44.3	44.1	43.6	44.00	0.36
	L-L	73.5	71.4	71.6	72.17	1.16
	AvRM-AvRM	48.1	48.1	48.7	48.30	0.35
MAN II- 04	IF-IF	53.5	52.9	53.6	53.33	0.38
	CRA-CRA	36.8	36.7	36.8	36.77	0.06
	GPF-GPF	31.2	30.5	31	30.90	0.36
	MRA-MRA	42.6	42.3	41.8	42.23	0.40
	CR-CR	16.3	17.7	16.8	16.93	0.71
	MF-MF	44.3	44.5	47.6	45.47	1.85
	L-L	84.1	84.2	83.6	83.97	0.32
	AvRM-AvRM	53.5	53.6	53.8	53.63	0.15

MAN II- 05	IF-IF	56.9	57.6	56.9	57.13	0.40
	CRA-CRA	31.2	30.9	31.2	31.10	0.17
	GPF-GPF	31.2	31	31.4	31.20	0.20
	MRA-MRA	36.2	36.9	35.9	36.33	0.51
	CR-CR	23.2	22.8	23.5	23.17	0.35
	MF-MF	48.3	48.6	48.3	48.40	0.17
	L-L	85.6	86	84	85.20	1.06
	AvRM-AvRM	52.2	51.5	51	51.57	0.60
MAN II- 06	IF-IF	45.9	44.6	44.8	45.10	0.70
	CRA-CRA	26.5	25.7	25.8	26.00	0.44
	GPF-GPF	25.5	26	25.8	25.77	0.25
	MRA-MRA	32.2	32.3	31.6	32.03	0.38
	CR-CR	19.8	19.6	19.1	19.50	0.36
	MF-MF	43.5	42.8	42.6	42.97	0.47
	L-L	70	70.3	70	70.10	0.17
	AvRM-AvRM	50.7	50.6	51.3	50.87	0.38
MAN II- 07	IF-IF	52.2	52.2	52.2	52.20	0.00
	CRA-CRA	28.1	28.3	28	28.13	0.15
	GPF-GPF	30.7	30.4	30.4	30.50	0.17
	MRA-MRA	34.5	35.9	35.8	35.40	0.78
	CR-CR	22	22	21.5	21.83	0.29
	MF-MF	46.7	46.1	46.7	46.50	0.35
	L-L	80.7	78.7	81	80.13	1.25
	AvRM-AvRM	53.9	53.7	54	53.87	0.15
MAN II- 08	IF-IF	49.5	48.6	48.6	48.90	0.52
	CRA-CRA	30.7	31.6	30.7	31.00	0.52
	GPF-GPF	29.9	29	29.2	29.37	0.47
	MRA-MRA	31.3	31.8	31.8	31.63	0.29
	CR-CR	25.8	25.6	25.3	25.57	0.25
	MF-MF	48.6	49.7	49.1	49.13	0.55
	L-L	82.9	82.3	81.8	82.33	0.55
	AvRM-AvRM	52.5	53.8	54.2	53.50	0.89
MAN II- 09	IF-IF	49.4	49.1	49.5	49.33	0.21
	CRA-CRA	28.4	28.7	29	28.70	0.30
	GPF-GPF	29.6	29.4	29.2	29.40	0.20
	MRA-MRA	34.5	34.3	33.9	34.23	0.31
	CR-CR	22.5	22	23.3	22.60	0.66
	MF-MF	44.8	44.6	45	44.80	0.20
	L-L	77.3	77.5	76.9	77.23	0.31

	AvRM-AvRM	53.9	53.6	53.2	53.57	0.35
MAN II- 10	IF-IF	50.3	50.8	50.5	50.53	0.25
	CRA-CRA	30	30.3	30.3	30.20	0.17
	GPF-GPF	31	31.5	31.3	31.27	0.25
	MRA-MRA	31.3	31.8	32.2	31.77	0.45
	CR-CR	23	22.8	22.7	22.83	0.15
	MF-MF	41.7	42.2	42	41.97	0.25
	L-L	82.9	83.5	82.9	83.10	0.35
	AvRM-AvRM	54.3	54	54.3	54.20	0.17
MAN II- 11	IF-IF	50.6	51.9	51.8	51.43	0.72
	CRA-CRA	28.8	28.8	29	28.87	0.12
	GPF-GPF	32.5	31.5	31.9	31.97	0.50
	MRA-MRA	41.5	42.4	41.5	41.80	0.52
	CR-CR	19.7	20.6	21.3	20.53	0.80
	MF-MF	48.2	48.2	47.8	48.07	0.23
	L-L	82.3	80.9	81.9	81.70	0.72
	AvRM-AvRM	52.3	52.5	51.8	52.20	0.36
MAN II- 12	IF-IF	42.9	43	43.5	43.13	0.32
	CRA-CRA	28.6	28	28	28.20	0.35
	GPF-GPF	30.3	30.1	30.3	30.23	0.12
	MRA-MRA	38.4	38.7	38.9	38.67	0.25
	CR-CR	21.8	20.9	21.8	21.50	0.52
	MF-MF	45.2	44.9	44.7	44.93	0.25
	L-L	77.2	76.5	76.7	76.80	0.36
	AvRM-AvRM	52.2	52.1	51.7	52.00	0.26
MAN II- 13	IF-IF	56.6	56.8	57.3	56.90	0.36
	CRA-CRA	37.1	35.6	35.9	36.20	0.79
	GPF-GPF	32.3	31.5	31.8	31.87	0.40
	MRA-MRA	38.7	38.9	38.3	38.63	0.31
	CR-CR	22	21.8	20.6	21.47	0.76
	MF-MF	49.2	48.5	49.4	49.03	0.47
	L-L	86.3	86	86	86.10	0.17
	AvRM-AvRM	51.8	52.5	52.4	52.23	0.38
MAN II- 14	IF-IF	51.6	50.2	52.2	51.33	1.03
	CRA-CRA	27.5	28.7	27.7	27.97	0.64
	GPF-GPF	26.7	26.1	25.7	26.17	0.50
	MRA-MRA	30.1	30.1	30.3	30.17	0.12
	CR-CR	21.1	22.1	21.9	21.70	0.53

	MF-MF	44.6	44.4	44.8	44.60	0.20
	L-L	79.1	78.5	78.7	78.77	0.31
	AvRM-AvRM	55.7	55.2	55.4	55.43	0.25
MAN II- 15	IF-IF	46.5	47.4	47.8	47.23	0.67
	CRA-CRA	26.1	24.7	24.9	25.23	0.76
	GPF-GPF	25.9	25.3	25.1	25.43	0.42
	MRA-MRA	28.9	29.3	28.6	28.93	0.35
	CR-CR	22	22.2	21.2	21.80	0.53
	MF-MF	42.2	42.7	42.7	42.53	0.29
	L-L	75.8	74.8	74.6	75.07	0.64
	AvRM-AvRM	51.4	51.4	51.8	51.53	0.23
MAN II- 16	IF-IF	47.6	48	48.3	47.97	0.35
	CRA-CRA	29	28.8	29.5	29.10	0.36
	GPF-GPF	27.6	27.4	27.6	27.53	0.12
	MRA-MRA	31.6	31.1	31.3	31.33	0.25
	CR-CR	17.5	19.5	18.7	18.57	1.01
	MF-MF	44.9	44.9	44.7	44.83	0.12
	L-L	84.1	84.3	84.6	84.33	0.25
	AvRM-AvRM	52.7	52.8	53.2	52.90	0.26
MAN II- 17	IF-IF	53.2	53.2	53.6	53.33	0.23
	CRA-CRA	31	30.8	31.6	31.13	0.42
	GPF-GPF	26.8	28.3	28.1	27.73	0.81
	MRA-MRA	29.2	29.7	29.9	29.60	0.36
	CR-CR	19.1	19.4	18.6	19.03	0.40
	MF-MF	41	41.1	40.8	40.97	0.15
	L-L	81.4	81.7	81.6	81.57	0.15
	AvRM-AvRM	45.1	45.1	44.9	45.03	0.12
MAN II- 18	IF-IF	42.6	42.6	42.6	42.60	0.00
	CRA-CRA	27.9	27.2	27.3	27.47	0.38
	GPF-GPF	26.8	26.1	25.9	26.27	0.47
	MRA-MRA	32.3	31.9	32.8	32.33	0.45
	CR-CR	22	22.9	23.1	22.67	0.59
	MF-MF	42.4	42.9	42.6	42.63	0.25
	L-L	78.4	77.8	78	78.07	0.31
	AvRM-AvRM	50.1	49.2	49.2	49.50	0.52
MAN II- 19	IF-IF	60.2	58.5	59.3	59.33	0.85
	CRA-CRA	28.7	28.4	29.6	28.90	0.62
	GPF-GPF	32.8	33.1	32.8	32.90	0.17

	MRA-MRA	32.8	34.4	34.2	33.80	0.87
	CR-CR	15.6	15.9	15.9	15.80	0.17
	MF-MF	50.6	51	50.6	50.73	0.23
	L-L	90.6	90.8	90.6	90.67	0.12
	AvRM-AvRM	52.1	52.1	52.7	52.30	0.35
MAN II- 20	IF-IF	50.3	51.6	50.8	50.90	0.66
	CRA-CRA	28	28.3	28.3	28.20	0.17
	GPF-GPF	32.1	32.4	32.4	32.30	0.17
	MRA-MRA	33.3	33.5	33.5	33.43	0.12
	CR-CR	22.9	23.5	22.2	22.87	0.65
	MF-MF	40.6	40.6	40.9	40.70	0.17
	L-L	82.1	82.1	81.7	81.97	0.23
	AvRM-AvRM	49.9	49.7	49.9	49.83	0.12
MAN II- 21	IF-IF	54.5	54.9	54.2	54.53	0.35
	CRA-CRA	31.5	31.6	31.7	31.60	0.10
	GPF-GPF	33.3	32.8	33.5	33.20	0.36
	MRA-MRA	44.3	44.5	43.8	44.20	0.36
	CR-CR	18.7	18.6	19.1	18.80	0.26
	MF-MF	52.1	52.1	52.3	52.17	0.12
	L-L	87.5	86.9	88.1	87.50	0.60
	AvRM-AvRM	53.4	53.6	53.4	53.47	0.12
MAN II- 22	IF-IF	44.8	46.5	45.9	45.73	0.86
	CRA-CRA	20.7	21.2	21.6	21.17	0.45
	GPF-GPF	25.5	25.5	25.7	25.57	0.12
	MRA-MRA	30.3	29.7	29.9	29.97	0.31
	CR-CR	13.7	14.4	13.9	14.00	0.36
	MF-MF	44.4	43.9	44.6	44.30	0.36
	L-L	75.3	75.6	75.3	75.40	0.17
	AvRM-AvRM	50.4	51.9	51.6	51.30	0.79
MAN II- 23	IF-IF	41.3	40.5	41.5	41.10	0.53
	CRA-CRA	30.8	30.4	29.6	30.27	0.61
	GPF-GPF	22.2	22.4	22.6	22.40	0.20
	MRA-MRA	30	30.4	29.6	30.00	0.40
	CR-CR	19.5	19.7	19.1	19.43	0.31
	MF-MF	40.5	40.7	41.1	40.77	0.31
	L-L	68.6	68.2	68.6	68.47	0.23
	AvRM-AvRM	51.8	50.8	51.4	51.33	0.50
MAN II- 24	IF-IF	48.8	48.9	49.2	48.97	0.21

	CRA-CRA	28.4	28.1	29.3	28.60	0.62
	GPF-GPF	30	30.5	30	30.17	0.29
	MRA-MRA	31	31.9	31.2	31.37	0.47
	CR-CR	22.3	21.6	23.7	22.53	1.07
	MF-MF	49.3	48.8	49.5	49.20	0.36
	L-L	80.5	79.5	79.8	79.93	0.51
	AvRM-AvRM	52.6	52.8	52.8	52.73	0.12
MAN II- 25	IF-IF	54	53.6	52.6	53.40	0.72
	CRA-CRA	28.9	28.6	29	28.83	0.21
	GPF-GPF	30.6	31.5	31.4	31.17	0.49
	MRA-MRA	36	35.4	36.2	35.87	0.42
	CR-CR	24.7	25.5	25.1	25.10	0.40
	MF-MF	43.4	43.2	42.8	43.13	0.31
	L-L	84.3	84.3	85.3	84.63	0.58
	AvRM-AvRM	47.7	47.7	47.4	47.60	0.17
MAN II- 26	IF-IF	49.6	49.8	49.8	49.73	0.12
	CRA-CRA	25.6	24.5	25.1	25.07	0.55
	GPF-GPF	29.2	29.5	29.1	29.27	0.21
	MRA-MRA	25.5	25.5	25.4	25.47	0.06
	CR-CR	18.2	17.9	18.1	18.07	0.15
	MF-MF	43.1	42.5	42.6	42.73	0.32
	L-L	77.5	77.3	77.3	77.37	0.12
	AvRM-AvRM	50.8	50.6	50.8	50.73	0.12
MAN II- 27	IF-IF	38.4	39.3	38.4	38.70	0.52
	CRA-CRA	26.2	26.4	27.3	26.63	0.59
	GPF-GPF	23.2	23.2	23.4	23.27	0.12
	MRA-MRA	26	26.2	26.7	26.30	0.36
	CR-CR	21.8	21.7	22.4	21.97	0.38
	MF-MF	43.2	42.1	42.6	42.63	0.55
	L-L	77.1	78.1	78.2	77.80	0.61
	AvRM-AvRM	54.2	53	53.6	53.60	0.60
MAN II- 28	IF-IF	47.7	48.9	47.7	48.10	0.69
	CRA-CRA	26.7	26.3	26.3	26.43	0.23
	GPF-GPF	26.5	26.1	26.5	26.37	0.23
	MRA-MRA	37	37	37.2	37.07	0.12
	CR-CR	23.6	24	23.4	23.67	0.31
	MF-MF	43.4	43.4	42.8	43.20	0.35
	L-L	82.2	82.3	81.6	82.03	0.38
	AvRM-AvRM	49.4	49.4	49.4	49.40	0.00

MAN II- 29	IF-IF	50.7	50.3	51.1	50.70	0.40
	CRA-CRA	29.2	29.6	29.4	29.40	0.20
	GPF-GPF	32.2	32.4	32.5	32.37	0.15
	MRA-MRA	36.1	35.6	36.7	36.13	0.55
	CR-CR	19.6	20.1	19.3	19.67	0.40
	MF-MF	39.9	40.4	39.5	39.93	0.45
	L-L	81.2	81.5	81	81.23	0.25
	AvRM-AvRM	53.8	52.8	52.1	52.90	0.85
MAN II- 30	IF-IF	46.2	46.8	46.6	46.53	0.31
	CRA-CRA	26	26	25.4	25.80	0.35
	GPF-GPF	28.7	28.9	28.9	28.83	0.12
	MRA-MRA	31.7	32.4	32.6	32.23	0.47
	CR-CR	20.1	20.8	19.4	20.10	0.70
	MF-MF	48.8	48.4	48.8	48.67	0.23
	L-L	78.5	78.7	78.1	78.43	0.31
	AvRM-AvRM	52.3	52.8	52.3	52.47	0.29

	RATIOS (Anterior Width Ratio)				RATIOS (Posterior Width Ratio)			
CL I PATIENTS (1-30)	**IF:MF**	**IF: CR**	**CRA: MF**	**CRA:CR**	**GPF:L**	**GPF:AvRM**	**MRA:L**	**MRA:AvRM**
MAN II-01	1.00	2.53	0.61	1.54	0.33	0.56	0.33	0.55
MAN II-02	1.07	1.96	0.64	1.18	0.35	0.52	0.38	0.57
MAN II-03	1.01	2.13	0.56	1.18	0.37	0.55	0.39	0.58
MAN II-04	1.17	3.15	0.81	2.17	0.37	0.58	0.50	0.79
MAN II-05	1.18	2.47	0.64	1.34	0.37	0.61	0.43	0.70
MAN II-06	1.05	2.31	0.61	1.33	0.37	0.51	0.46	0.63
MAN II-07	1.12	2.39	0.61	1.29	0.38	0.57	0.44	0.66
MAN II-08	1.00	1.91	0.63	1.21	0.36	0.55	0.38	0.59
MAN II-09	1.10	2.18	0.64	1.27	0.38	0.55	0.44	0.64
MAN II-10	1.20	2.21	0.72	1.32	0.38	0.58	0.38	0.59
MAN II-11	1.07	2.50	0.60	1.41	0.39	0.61	0.51	0.80
MAN II-12	0.96	2.01	0.63	1.31	0.39	0.58	0.50	0.74
MAN II-13	1.16	2.65	0.74	1.69	0.37	0.61	0.45	0.74
MAN II-14	1.15	2.37	0.63	1.29	0.33	0.47	0.38	0.54
MAN II-15	1.11	2.17	0.59	1.16	0.34	0.49	0.39	0.56
MAN II-16	1.07	2.58	0.65	1.57	0.33	0.52	0.37	0.59
MAN II-17	1.30	2.80	0.76	1.64	0.34	0.62	0.36	0.66
MAN II-18	1.00	1.88	0.64	1.21	0.34	0.53	0.41	0.65
MAN II-19	1.17	3.76	0.57	1.83	0.36	0.63	0.37	0.65
MAN II-20	1.25	2.23	0.69	1.23	0.39	0.65	0.41	0.67
MAN II-21	1.05	2.90	0.61	1.68	0.38	0.62	0.51	0.83
MAN II-22	1.03	3.27	0.48	1.51	0.34	0.50	0.40	0.58
MAN II-23	1.01	2.11	0.74	1.56	0.33	0.44	0.44	0.58
MAN II-24	1.00	2.17	0.58	1.27	0.38	0.57	0.39	0.59
MAN II-25	1.24	2.13	0.67	1.15	0.37	0.65	0.42	0.75
MAN II-26	1.16	2.75	0.59	1.39	0.38	0.58	0.33	0.50
MAN II-27	0.91	1.76	0.62	1.21	0.30	0.43	0.34	0.49
MAN II-28	1.11	2.03	0.61	1.12	0.32	0.53	0.45	0.75
MAN II-29	1.27	2.58	0.74	1.49	0.40	0.61	0.44	0.68
MAN II-30	0.96	2.32	0.53	1.28	0.37	0.55	0.41	0.61
AVG	1.10	2.41	0.64	1.39	0.36	0.56	0.41	0.64
STDEV	0.10	0.44	0.07	0.24	0.03	0.06	0.05	0.09

CL I Patients						
	Landmark	**Raw Average**	**Std Dev**	**Max**	**Min**	**Intrarater reliability (avg std dev/pt)**
ANTERIOR	IF-IF	49.19	4.84	59.33	38.70	0.47
	CRA-CRA	28.59	3.13	36.77	21.17	0.40
	CR-CR	20.83	2.91	25.57	14.00	0.30
	MF-MF	44.96	4.69	52.17	39.93	0.39
POSTERIOR	GPF-GPF	28.84	2.75	33.20	22.40	0.46
	MRA-MRA	33.24	3.20	44.20	25.47	0.34
	L-L	80.17	4.92	90.67	68.47	0.44
	AvRM-AvRM	51.70	2.39	55.43	45.03	0.35

RATIOS (Anterior Mx/Mn Width Ratio)

	IF:MF	**IF: CR**	**CRA: MF**	**CRA:CR**
Average	1.10	2.41	0.64	1.39
St Dev	0.10	0.44	0.07	0.24
Maximum	1.30	3.76	0.81	2.17
Minimum	0.91	1.76	0.48	1.12

RATIOS (Posterior Mx/Mn Width Ratio)

	GPF:L	**GPF:AvRM**	**MRA:L**	**MRA:AvRM**
Average	0.36	0.56	0.41	0.64
St Dev	0.03	0.06	0.05	0.09
Maximum	0.40	0.65	0.51	0.83
Minimum	0.30	0.43	0.33	0.49

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

CL II PATIENTS Mx Protrusion (1-30)

		Timepoint 1	Timepoint 2	Timepoint 3	Mean	SD
PROG- 1	IF-IF	48.7	48.4	49	48.70	0.30
	CRA-CRA	29.1	28.8	29.2	29.03	0.21
	GPF-GPF	29.7	29.2	29.2	29.37	0.29
	MRA-MRA	36	35.7	36.4	36.03	0.35
	CR-CR	23.2	22.9	23.6	23.23	0.35
	MF-MF	50.4	50.1	50.9	50.47	0.40
	L-L	83.5	83.5	83.5	83.50	0.00
	AvRM-AvRM	55.4	55.4	55.4	55.40	0.00
PROG- 2	IF-IF	53.6	53.8	53.8	53.73	0.12
	CRA-CRA	28.2	28.6	28.4	28.40	0.20
	GPF-GPF	33	33.2	33.2	33.13	0.12
	MRA-MRA	38.4	39	39	38.80	0.35
	CR-CR	20.2	20.6	20.4	20.40	0.20
	MF-MF	48.4	48.1	48.1	48.20	0.17
	L-L	82.5	82.5	82.5	82.50	0.00
	AvRM-AvRM	52.4	53	52.7	52.70	0.30
PROG-3	IF-IF	50.7	50.3	51.3	50.77	0.50
	CRA-CRA	25.2	24.8	25.3	25.10	0.26
	GPF-GPF	29.5	30.2	29.1	29.60	0.56
	MRA-MRA	30.7	31.1	30.7	30.83	0.23
	CR-CR	18.8	18.8	18.4	18.67	0.23
	MF-MF	43.9	44.8	45.7	44.80	0.90
	L-L	75.6	76.5	76.5	76.20	0.52
	AvRM-AvRM	50.5	51	50.4	50.63	0.32
PROG-4	IF-IF	58.3	58.3	58.3	58.30	0.00
	CRA-CRA	32.2	32.2	31.9	32.10	0.17
	GPF-GPF	27.8	27.8	27.8	27.80	0.00
	MRA-MRA	35.5	35.2	35.5	35.40	0.17
	CR-CR	18.2	18.4	19.1	18.57	0.47
	MF-MF	46.8	46.8	46.1	46.57	0.40
	L-L	84.1	83.8	83.8	83.90	0.17
	AvRM-AvRM	60.3	59.8	59.4	59.83	0.45
PROG-5	IF-IF	53	53.3	53.2	53.17	0.15
	CRA-CRA	29.2	30.2	29.9	29.77	0.51
	GPF-GPF	31.6	31.9	32.1	31.87	0.25

	MRA-MRA	34.9	34.9	34.6	34.80	0.17
	CR-CR	22.6	22.7	22.1	22.47	0.32
	MF-MF	50.3	50.8	50.3	50.47	0.29
	L-L	88.5	88.2	89.3	88.67	0.57
	AvRM-AvRM	52.6	52.8	52.6	52.67	0.12
PROG-6	IF-IF	58.8	58.2	57.9	58.30	0.46
	CRA-CRA	32.2	32.4	32.2	32.27	0.12
	GPF-GPF	28.6	28.8	28.8	28.73	0.12
	MRA-MRA	32.4	32.5	31.9	32.27	0.32
	CR-CR	16	16.5	16.3	16.27	0.25
	MF-MF	47	47.3	47	47.10	0.17
	L-L	82.4	82.1	82.1	82.20	0.17
	AvRM-AvRM	52.2	51.8	51.5	51.83	0.35
PROG-7	IF-IF	50	50.5	50.8	50.43	0.40
	CRA-CRA	28.6	28.1	27.5	28.07	0.55
	GPF-GPF	31.3	30.8	30.8	30.97	0.29
	MRA-MRA	35.7	36	36	35.90	0.17
	CR-CR	18.4	17.6	18.7	18.23	0.57
	MF-MF	41.2	41.7	40.9	41.27	0.40
	L-L	81.6	82.4	81.6	81.87	0.46
	AvRM-AvRM	51.1	51.6	51.9	51.53	0.40
PROG-8	IF-IF	51.3	51.3	51.3	51.30	0.00
	CRA-CRA	31.1	31.5	31.1	31.23	0.23
	GPF-GPF	28.9	29.3	28.6	28.93	0.35
	MRA-MRA	32.2	32.6	32.2	32.33	0.23
	CR-CR	14.3	15.1	14.6	14.67	0.40
	MF-MF	45.4	45.5	45.8	45.57	0.21
	L-L	79.4	79.5	80	79.63	0.32
	AvRM-AvRM	46.7	46.4	46.7	46.60	0.17
PROG-9	IF-IF	50.2	49.4	49.8	49.80	0.40
	CRA-CRA	25.9	25.1	24.7	25.23	0.61
	GPF-GPF	32.3	32.3	32.7	32.43	0.23
	MRA-MRA	32.4	31.1	31.4	31.63	0.68
	CR-CR	19.7	19.7	19.7	19.70	0.00
	MF-MF	46.7	45.7	46	46.13	0.51
	L-L	80.6	80.1	80.8	80.50	0.36
	AvRM-AvRM	48.9	49.2	49.2	49.10	0.17
PROG-10	IF-IF	55.6	55.2	55.6	55.47	0.23

	CRA-CRA	20.3	20.3	20.9	20.50	0.35
	GPF-GPF	27.1	26.8	26.6	26.83	0.25
	MRA-MRA	32.5	32.3	31.5	32.10	0.53
	CR-CR	18.1	18.1	18.4	18.20	0.17
	MF-MF	50.3	50.5	49.5	50.10	0.53
	L-L	77.3	77.5	78	77.60	0.36
	AvRM-AvRM	52.5	52.6	52.2	52.43	0.21
PROG-11	IF-IF	50.7	51.1	51.1	50.97	0.23
	CRA-CRA	32.9	33.5	32	32.80	0.75
	GPF-GPF	29.4	29.4	29.7	29.50	0.17
	MRA-MRA	39.5	39.1	39.1	39.23	0.23
	CR-CR	23.6	22.5	23.2	23.10	0.56
	MF-MF	48.6	48.9	48.2	48.57	0.35
	L-L	92.4	92	92.2	92.20	0.20
	AvRM-AvRM	56.6	56.6	56.9	56.70	0.17
PROG-12	IF-IF	43.4	42.9	42.6	42.97	0.40
	CRA-CRA	25.8	23.9	23.9	24.53	1.10
	GPF-GPF	30.2	31	31	30.73	0.46
	MRA-MRA	32.1	31.6	32.1	31.93	0.29
	CR-CR	16.5	17	17.4	16.97	0.45
	MF-MF	42	42.7	42.5	42.40	0.36
	L-L	84.6	83.8	83.5	83.97	0.57
	AvRM-AvRM	50.8	50.3	50	50.37	0.40
PROG-13	IF-IF	51.1	50.8	50.8	50.90	0.17
	CRA-CRA	26.3	26.3	26.9	26.50	0.35
	GPF-GPF	30.3	31	30.6	30.63	0.35
	MRA-MRA	32.5	33.7	32.7	32.97	0.64
	CR-CR	19.4	19.6	19.1	19.37	0.25
	MF-MF	46.6	46.2	46.4	46.40	0.20
	L-L	86.4	87.1	87.1	86.87	0.40
	AvRM-AvRM	53.3	53.5	54.2	53.67	0.47
PROG-14	IF-IF	58.6	57.7	57.5	57.93	0.59
	CRA-CRA	27.9	28.7	27	27.87	0.85
	GPF-GPF	33.6	33.9	33	33.50	0.46
	MRA-MRA	37.7	37.1	37.4	37.40	0.30
	CR-CR	18.3	18.6	18.9	18.60	0.30
	MF-MF	41.8	41.3	41.8	41.63	0.29
	L-L	82.3	80.7	81.7	81.57	0.81
	AvRM-AvRM	50.4	50.6	50.4	50.47	0.12

PROG-15	IF-IF	50.8	51.1	50.8	50.90	0.17
	CRA-CRA	28.5	28.2	28.5	28.40	0.17
	GPF-GPF	27.5	28.1	27.8	27.80	0.30
	MRA-MRA	33.5	34.1	33.5	33.70	0.35
	CR-CR	23.8	23.2	23.1	23.37	0.38
	MF-MF	44.7	45	44.7	44.80	0.17
	L-L	81.2	80.9	81.9	81.33	0.51
	AvRM-AvRM	52.3	51.6	52.1	52.00	0.36
PROG-16	IF-IF	46.7	45.9	46.4	46.33	0.40
	CRA-CRA	29.5	30.3	31.1	30.30	0.80
	GPF-GPF	25.8	26	25.8	25.87	0.12
	MRA-MRA	30.7	29.8	30.5	30.33	0.47
	CR-CR	22.4	22.9	22.8	22.70	0.26
	MF-MF	41.5	40.5	42.3	41.43	0.90
	L-L	83.5	84.2	83.7	83.80	0.36
	AvRM-AvRM	48.9	48.9	49.1	48.97	0.12
PROG-17	IF-IF	52.7	52.2	52.2	52.37	0.29
	CRA-CRA	30.2	30.5	30.5	30.40	0.17
	GPF-GPF	31.9	32.6	32.4	32.30	0.36
	MRA-MRA	30.1	31	30.8	30.63	0.47
	CR-CR	18.1	17.8	18.3	18.07	0.25
	MF-MF	44.7	43.6	45.2	44.50	0.82
	L-L	88.4	88.2	87.3	87.97	0.59
	AvRM-AvRM	52.3	52.5	52.7	52.50	0.20
PROG-18	IF-IF	47.4	47.1	46.9	47.13	0.25
	CRA-CRA	23.8	23.7	23.8	23.77	0.06
	GPF-GPF	30	30.5	30.2	30.23	0.25
	MRA-MRA	33.1	32.3	33.3	32.90	0.53
	CR-CR	26.1	25.6	26.1	25.93	0.29
	MF-MF	43.2	42.3	43.6	43.03	0.67
	L-L	83.4	83.8	83.2	83.47	0.31
	AvRM-AvRM	53.6	53.4	53.4	53.47	0.12
PROG-19	IF-IF	61.8	61.1	61.4	61.43	0.35
	CRA-CRA	32.3	32.6	32.3	32.40	0.17
	GPF-GPF	34	34	34.4	34.13	0.23
	MRA-MRA	40.3	40	40	40.10	0.17
	CR-CR	20.8	20.8	20.8	20.80	0.00
	MF-MF	50.3	50.1	50.3	50.23	0.12

	L-L	81.9	82.2	81.9	82.00	0.17
	AvRM-AvRM	57.3	57.1	58	57.47	0.47
PROG-20	IF-IF	41.5	41.3	41.3	41.37	0.12
	CRA-CRA	21.9	21.9	21.8	21.87	0.06
	GPF-GPF	25.3	25.7	25.5	25.50	0.20
	MRA-MRA	31.5	32.2	32.3	32.00	0.44
	CR-CR	18.5	17.8	18.5	18.27	0.40
	MF-MF	42.9	43.4	42.7	43.00	0.36
	L-L	81.2	82.6	82.8	82.20	0.87
	AvRM-AvRM	49.2	49.4	49.2	49.27	0.12
PROG-21	IF-IF	46.4	46.4	46.1	46.30	0.17
	CRA-CRA	27.4	27.4	27.4	27.40	0.00
	GPF-GPF	28.2	28.6	28.5	28.43	0.21
	MRA-MRA	34.9	33.5	34.3	34.23	0.70
	CR-CR	17	17.1	17	17.03	0.06
	MF-MF	42.6	42.4	41.8	42.27	0.42
	L-L	74.5	74.8	74.3	74.53	0.25
	AvRM-AvRM	50.2	50.5	50	50.23	0.25
PROG-22	IF-IF	44.9	44.4	44.9	44.73	0.29
	CRA-CRA	29.2	29.7	29.2	29.37	0.29
	GPF-GPF	30.7	30.3	30.7	30.57	0.23
	MRA-MRA	35.8	36.2	36	36.00	0.20
	CR-CR	21.9	21.4	21.2	21.50	0.36
	MF-MF	43	42.6	42.6	42.73	0.23
	L-L	81.3	83.1	84.1	82.83	1.42
	AvRM-AvRM	53.4	54.7	53.7	53.93	0.68
PROG-23	IF-IF	50.1	48.7	49.1	49.30	0.72
	CRA-CRA	33.1	32.4	32.4	32.63	0.40
	GPF-GPF	28	28.5	28.2	28.23	0.25
	MRA-MRA	37.1	37.4	37.1	37.20	0.17
	CR-CR	17.4	17.1	17.4	17.30	0.17
	MF-MF	44.2	44.9	45.3	44.80	0.56
	L-L	81.3	81.5	81.7	81.50	0.20
	AvRM-AvRM	52.7	52	52.4	52.37	0.35
PROG-24	IF-IF	49.8	49.1	50.1	49.67	0.51
	CRA-CRA	29.1	30.5	30.3	29.97	0.76
	GPF-GPF	29.2	29.2	28.8	29.07	0.23
	MRA-MRA	31.6	31.6	31.4	31.53	0.12

	CR-CR	19.1	19.1	18.9	19.03	0.12
	MF-MF	46.4	46.4	45.9	46.23	0.29
	L-L	82.2	82.6	82.8	82.53	0.31
	AvRM-AvRM	55.2	54.9	54.5	54.87	0.35
PROG-25	IF-IF	51.5	52.3	51.2	51.67	0.57
	CRA-CRA	33.7	33.4	31.4	32.83	1.25
	GPF-GPF	28.5	28.6	28.3	28.47	0.15
	MRA-MRA	30.4	31.5	30.6	30.83	0.59
	CR-CR	21	21	21.6	21.20	0.35
	MF-MF	46.5	46.5	46.7	46.57	0.12
	L-L	77.9	77.4	77.9	77.73	0.29
	AvRM-AvRM	54.8	54.8	55.1	54.90	0.17
PROG-26	IF-IF	50.3	51.8	49.6	50.57	1.12
	CRA-CRA	29.8	29.6	29.3	29.57	0.25
	GPF-GPF	29.4	29.3	29.8	29.50	0.26
	MRA-MRA	33.8	33.6	33.8	33.73	0.12
	CR-CR	20.3	20.5	21.8	20.87	0.81
	MF-MF	47.8	48	48	47.93	0.12
	L-L	79.4	79.2	79.4	79.33	0.12
	AvRM-AvRM	54.3	54.2	54.2	54.23	0.06
PROG-27	IF-IF	51.3	50.9	51.2	51.13	0.21
	CRA-CRA	33.7	32.7	32	32.80	0.85
	GPF-GPF	29.7	30.8	30.1	30.20	0.56
	MRA-MRA	38.4	38.8	38	38.40	0.40
	CR-CR	22.8	23.6	22.5	22.97	0.57
	MF-MF	49	49.8	49.4	49.40	0.40
	L-L	82.4	82.7	83.6	82.90	0.62
	AvRM-AvRM	59.9	59.6	59.6	59.70	0.17
PROG-28	IF-IF	48.7	49.4	49.6	49.23	0.47
	CRA-CRA	28.8	29.6	28.3	28.90	0.66
	GPF-GPF	28.8	29.8	29.4	29.33	0.50
	MRA-MRA	35	35.2	34.8	35.00	0.20
	CR-CR	19.9	21.4	20.3	20.53	0.78
	MF-MF	44.8	44.8	44.4	44.67	0.23
	L-L	77.7	77.3	78	77.67	0.35
	AvRM-AvRM	52.1	52.1	52.6	52.27	0.29
PROG-29	IF-IF	47.7	47.2	47.7	47.53	0.29
	CRA-CRA	33.3	34.6	33.6	33.83	0.68

	GPF-GPF	30.5	30.3	30.4	30.40	0.10
	MRA-MRA	38.4	38.7	38.6	38.57	0.15
	CR-CR	18.6	19.6	18.9	19.03	0.51
	MF-MF	45.4	44.7	44	44.70	0.70
	L-L	79.3	79.4	79.6	79.43	0.15
	AvRM-AvRM	50.5	50.5	51.1	50.70	0.35
PROG-30	IF-IF	48	48.5	48.2	48.23	0.25
	CRA-CRA	30.1	29.5	29.5	29.70	0.35
	GPF-GPF	29.5	29.5	29.3	29.43	0.12
	MRA-MRA	39.4	39.6	38.9	39.30	0.36
	CR-CR	19.2	20.4	19.9	19.83	0.60
	MF-MF	41.8	41.2	41.1	41.37	0.38
	L-L	87	87.8	87.1	87.30	0.44
	AvRM-AvRM	48.9	48.7	48.7	48.77	0.12

CL II-P Patients (1-30)	RATIOS (Anterior Width Ratio)				RATIOS (Posterior Width Ratio)			
	IF:MF	IF: CR	CRA: MF	CRA:CR	GPF:L	GPF:AvRM	MRA:L	MRA:AvRM
PROG- 1	0.96	2.10	0.58	1.25	0.35	0.53	0.43	0.65
PROG- 2	1.11	2.63	0.59	1.39	0.40	0.63	0.47	0.74
PROG- 3	1.13	2.72	0.56	1.34	0.39	0.58	0.40	0.61
PROG- 4	1.25	3.14	0.69	1.73	0.33	0.46	0.42	0.59
PROG- 5	1.05	2.37	0.59	1.32	0.36	0.61	0.39	0.66
PROG- 6	1.24	3.58	0.69	1.98	0.35	0.55	0.39	0.62
PROG- 7	1.22	2.77	0.68	1.54	0.38	0.60	0.44	0.70
PROG- 8	1.13	3.50	0.69	2.13	0.36	0.62	0.41	0.69
PROG- 9	1.08	2.53	0.55	1.28	0.40	0.66	0.39	0.64
PROG- 10	1.11	3.05	0.41	1.13	0.35	0.51	0.41	0.61
PROG- 11	1.05	2.21	0.68	1.42	0.32	0.52	0.43	0.69
PROG- 12	1.01	2.53	0.58	1.45	0.37	0.61	0.38	0.63
PROG- 13	1.10	2.63	0.57	1.37	0.35	0.57	0.38	0.61
PROG- 14	1.39	3.11	0.67	1.50	0.41	0.66	0.46	0.74
PROG- 15	1.14	2.18	0.63	1.22	0.34	0.53	0.41	0.65
PROG- 16	1.12	2.04	0.73	1.33	0.31	0.53	0.36	0.62
PROG- 17	1.18	2.90	0.68	1.68	0.37	0.62	0.35	0.58
PROG- 18	1.10	1.82	0.55	0.92	0.36	0.57	0.39	0.62
PROG- 19	1.22	2.95	0.64	1.56	0.42	0.59	0.49	0.70
PROG- 20	0.96	2.26	0.51	1.20	0.31	0.52	0.39	0.65
PROG- 21	1.10	2.72	0.65	1.61	0.38	0.57	0.46	0.68
PROG- 22	1.05	2.08	0.69	1.37	0.37	0.57	0.43	0.67
PROG- 23	1.10	2.85	0.73	1.89	0.35	0.54	0.46	0.71
PROG- 24	1.07	2.61	0.65	1.57	0.35	0.53	0.38	0.57
PROG- 25	1.11	2.44	0.71	1.55	0.37	0.52	0.40	0.56
PROG- 26	1.05	2.42	0.62	1.42	0.37	0.54	0.43	0.62
PROG- 27	1.04	2.23	0.66	1.43	0.36	0.51	0.46	0.64
PROG- 28	1.10	2.40	0.65	1.41	0.38	0.56	0.45	0.67
PROG- 29	1.06	2.50	0.76	1.78	0.38	0.60	0.49	0.76
PROG- 30	1.17	2.43	0.72	1.50	0.34	0.60	0.45	0.81
AVG	1.11	2.59	0.64	1.47	0.36	0.57	0.42	0.66
STDEV	0.09	0.42	0.08	0.25	0.03	0.05	0.04	0.06

CL II Mx Protrusive PATIENTS						
		Raw Average	Std Dev	Max	Min	Intrarater reliability (avg std dev/pt)
ANTERIOR	IF-IF	50.69	4.49	61.43	41.37	0.34
	CRA-CRA	28.92	3.40	33.83	20.50	0.44
	CR-CR	19.90	2.08	25.93	14.67	0.27
	MF-MF	45.58	3.00	50.47	41.27	0.34
POSTERIOR	GPF-GPF	29.78	2.51	34.13	25.50	0.35
	MRA-MRA	34.54	2.92	40.10	30.33	0.39
	L-L	82.26	3.80	92.20	74.53	0.40
	AvRM-AvRM	52.65	3.11	59.83	46.60	0.26

RATIOS (Anterior Mx/Mn Width Ratio)

	IF:MF	IF: CR	CRA: MF	CRA:CR
Average	1.11	2.59	0.64	1.47
St Dev	0.09	0.42	0.08	0.25
Maximum	1.39	3.58	0.76	2.13
Minimum	0.96	1.82	0.41	0.92

RATIOS (Posterior Mx/Mn Width Ratio)

	GPF:L	GPF:AvRM	MRA:L	MRA:AvRM
Average	0.36	0.57	0.42	0.66
St Dev	0.03	0.05	0.04	0.06
Maximum	0.42	0.66	0.49	0.81
Minimum	0.31	0.46	0.35	0.56

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

CL II PATIENTS Mn Retrusion (1-30)

		Timepoint 1	Timepoint 2	Timepoint 3	Mean	SD
RET- 1	IF-IF	46.2	46.4	45.6	46.07	0.42
	CRA-CRA	31.7	30.5	29.9	30.70	0.92
	GPF-GPF	27	27.5	27	27.17	0.29
	MRA-MRA	32.8	32.8	33.3	32.97	0.29
	CR-CR	16.5	17.1	17.4	17.00	0.46
	MF-MF	41.5	41.7	41.2	41.47	0.25
	L-L	75.8	75.8	76	75.87	0.12
	AvRM-AvRM	52.4	52.4	52.4	52.40	0.00
RET- 2	IF-IF	47	47.7	47.7	47.47	0.40
	CRA-CRA	28.9	28.7	28.9	28.83	0.12
	GPF-GPF	29	28.6	28.6	28.73	0.23
	MRA-MRA	35.8	35.7	35.5	35.67	0.15
	CR-CR	18	16.8	17.1	17.30	0.62
	MF-MF	44	44.5	43.8	44.10	0.36
	L-L	77.4	78.4	78.1	77.97	0.51
	AvRM-AvRM	47.6	47.4	47.4	47.47	0.12
RET- 3	IF-IF	60.6	61.1	60.6	60.77	0.29
	CRA-CRA	33.3	33.5	33.7	33.50	0.20
	GPF-GPF	33.7	33.2	33.4	33.43	0.25
	MRA-MRA	32.9	32.6	32.8	32.77	0.15
	CR-CR	15.9	15.5	15.2	15.53	0.35
	MF-MF	47.5	47.7	47.3	47.50	0.20
	L-L	82.1	83	82.5	82.53	0.45
	AvRM-AvRM	48.4	48.2	48.6	48.40	0.20
RET- 4	IF-IF	46.8	47.2	47.3	47.10	0.26
	CRA-CRA	25.8	25.4	25	25.40	0.40
	GPF-GPF	31.8	31.2	32.3	31.77	0.55
	MRA-MRA	30.2	30.2	30	30.13	0.12
	CR-CR	20.4	20.9	20.6	20.63	0.25
	MF-MF	48.5	48	47.5	48.00	0.50
	L-L	82	81.7	81.4	81.70	0.30
	AvRM-AvRM	54.4	54.4	54.6	54.47	0.12
RET- 5	IF-IF	45.7	46.5	46	46.07	0.40
	CRA-CRA	23.1	23.6	23.1	23.27	0.29

	GPF-GPF	27	27	26.8	26.93	0.12
	MRA-MRA	29.5	30.1	29.7	29.77	0.31
	CR-CR	19.5	19.5	19.2	19.40	0.17
	MF-MF	43.8	44.7	44.8	44.43	0.55
	L-L	75	75.3	75.6	75.30	0.30
	AvRM-AvRM	51	50.9	50.7	50.87	0.15
RET- 6	IF-IF	48	48.2	47.8	48.00	0.20
	CRA-CRA	33.5	32.6	33.6	33.23	0.55
	GPF-GPF	29.4	28.6	29	29.00	0.40
	MRA-MRA	33.8	34.6	33.6	34.00	0.53
	CR-CR	17.9	17.5	18.3	17.90	0.40
	MF-MF	41.3	42.4	41.5	41.73	0.59
	L-L	77.8	78.2	78.2	78.07	0.23
	AvRM-AvRM	47.3	47.6	47.6	47.50	0.17
RET- 7	IF-IF	51.4	51.4	51.6	51.47	0.12
	CRA-CRA	23.4	24.9	23.7	24.00	0.79
	GPF-GPF	28.6	28.6	28.4	28.53	0.12
	MRA-MRA	34.4	34.2	34.3	34.30	0.10
	CR-CR	18.7	20	19.8	19.50	0.70
	MF-MF	45.1	45.3	45	45.13	0.15
	L-L	80.9	81.5	81.5	81.30	0.35
	AvRM-AvRM	55.4	55.2	54.6	55.07	0.42
RET- 8	IF-IF	50.6	50.1	50.4	50.37	0.25
	CRA-CRA	26	25	24.8	25.27	0.64
	GPF-GPF	28.7	28.2	29.2	28.70	0.50
	MRA-MRA	31.7	31.2	31.4	31.43	0.25
	CR-CR	16.9	17.7	18.2	17.60	0.66
	MF-MF	41.2	41.7	42	41.63	0.40
	L-L	78.2	78.4	77.6	78.07	0.42
	AvRM-AvRM	51.1	51.3	51.7	51.37	0.31
RET- 9	IF-IF	45.7	46.6	45.3	45.87	0.67
	CRA-CRA	23.3	23.9	23	23.40	0.46
	GPF-GPF	26.7	26.5	26.7	26.63	0.12
	MRA-MRA	31.9	31.4	31.6	31.63	0.25
	CR-CR	19.4	19.7	19.5	19.53	0.15
	MF-MF	47.8	48.3	48	48.03	0.25
	L-L	80.4	79	79.3	79.57	0.74
	AvRM-AvRM	52.1	52.1	52.3	52.17	0.12

RET- 10	IF-IF	46.8	45.3	45.9	46.00	0.75
	CRA-CRA	24.6	24.8	25	24.80	0.20
	GPF-GPF	30.5	30.3	30.3	30.37	0.12
	MRA-MRA	35.1	35.7	35.5	35.43	0.31
	CR-CR	18.9	19.5	19.2	19.20	0.30
	MF-MF	42.9	43	42.7	42.87	0.15
	L-L	77.6	78	77.8	77.80	0.20
	AvRM-AvRM	49.8	49.8	50	49.87	0.12
RET- 11	IF-IF	54.8	54.2	55.1	54.70	0.46
	CRA-CRA	27.3	28.3	28.5	28.03	0.64
	GPF-GPF	31.2	30.8	30.3	30.77	0.45
	MRA-MRA	39.9	40.9	40.5	40.43	0.50
	CR-CR	17.7	18.5	18	18.07	0.40
	MF-MF	48.1	48.5	48.7	48.43	0.31
	L-L	79.3	79.3	79.1	79.23	0.12
	AvRM-AvRM	58.5	58.8	59	58.77	0.25
RET- 12	IF-IF	50.5	50.7	50.7	50.63	0.12
	CRA-CRA	29.8	29.1	29.4	29.43	0.35
	GPF-GPF	30.8	30.8	31.7	31.10	0.52
	MRA-MRA	32.9	32.3	32.6	32.60	0.30
	CR-CR	19.7	20.2	19.6	19.83	0.32
	MF-MF	43.9	43.4	43.9	43.73	0.29
	L-L	79.2	79.6	81.3	80.03	1.12
	AvRM-AvRM	52.1	52.1	51.5	51.90	0.35
RET- 13	IF-IF	46.6	47.7	47.3	47.20	0.56
	CRA-CRA	28.7	29.1	29.5	29.10	0.40
	GPF-GPF	26.7	27.3	27.2	27.07	0.32
	MRA-MRA	28.2	28.4	28.4	28.33	0.12
	CR-CR	21.2	21.4	22.1	21.57	0.47
	MF-MF	42.6	41.3	41.5	41.80	0.70
	L-L	79.7	79.5	79.1	79.43	0.31
	AvRM-AvRM	46.1	45.8	45.3	45.73	0.40
RET- 14	IF-IF	53.6	53.6	53.8	53.67	0.12
	CRA-CRA	28.3	28	27.8	28.03	0.25
	GPF-GPF	30.3	30.4	30.3	30.33	0.06
	MRA-MRA	34.3	33.2	33	33.50	0.70
	CR-CR	19.2	19.7	19.7	19.53	0.29
	MF-MF	37.4	37.4	37.3	37.37	0.06
	L-L	81.7	81.5	80.7	81.30	0.53

	AvRM-AvRM	51	51	51.2	51.07	0.12
RET- 15	IF-IF	56.7	57.4	57.8	57.30	0.56
	CRA-CRA	32.2	31.3	32.1	31.87	0.49
	GPF-GPF	33.3	33.1	33.9	33.43	0.42
	MRA-MRA	38.2	38.3	38.4	38.30	0.10
	CR-CR	22	22.9	21.5	22.13	0.71
	MF-MF	48.6	49.3	49.1	49.00	0.36
	L-L	84.3	84.6	84.9	84.60	0.30
	AvRM-AvRM	57.4	57.7	58	57.70	0.30
RET- 16	IF-IF	44.4	44.1	44.4	44.30	0.17
	CRA-CRA	24.8	25.5	25.4	25.23	0.38
	GPF-GPF	27.8	27.2	28.1	27.70	0.46
	MRA-MRA	28.4	28.4	28.1	28.30	0.17
	CR-CR	17.4	17.4	16.6	17.13	0.46
	MF-MF	46.4	46.2	46.4	46.33	0.12
	L-L	75.3	76.2	75.7	75.73	0.45
	AvRM-AvRM	54.2	54.6	55.6	54.80	0.72
RET- 17	IF-IF	49	49	48.7	48.90	0.17
	CRA-CRA	26	25.1	25.7	25.60	0.46
	GPF-GPF	30.5	30.3	29.7	30.17	0.42
	MRA-MRA	30.8	30.8	30.6	30.73	0.12
	CR-CR	20.3	21	21.3	20.87	0.51
	MF-MF	43.8	44.7	43.8	44.10	0.52
	L-L	83	82.1	83.3	82.80	0.62
	AvRM-AvRM	52	52.6	51.9	52.17	0.38
RET- 18	IF-IF	45.2	45.6	45	45.27	0.31
	CRA-CRA	24.9	24.2	24.4	24.50	0.36
	GPF-GPF	27.4	27.9	27.6	27.63	0.25
	MRA-MRA	30.7	29.9	29.8	30.13	0.49
	CR-CR	18.9	19.2	19.2	19.10	0.17
	MF-MF	41.1	41.9	41.3	41.43	0.42
	L-L	75.5	75.8	76.1	75.80	0.30
	AvRM-AvRM	46.8	47.6	47.4	47.27	0.42
RET- 19	IF-IF	49.2	48.8	49.1	49.03	0.21
	CRA-CRA	25	27.5	25.3	25.93	1.37
	GPF-GPF	27.9	28.8	28.6	28.43	0.47
	MRA-MRA	30.6	30.8	31	30.80	0.20
	CR-CR	19.3	19.1	19.3	19.23	0.12

	MF-MF	45.1	45.1	46.8	45.67	0.98
	L-L	79.9	78.8	79.4	79.37	0.55
	AvRM-AvRM	51.2	52.2	52.2	51.87	0.58
RET- 20	IF-IF	50.7	50.9	50.7	50.77	0.12
	CRA-CRA	32.8	32.3	32.5	32.53	0.25
	GPF-GPF	29.2	29.5	29.4	29.37	0.15
	MRA-MRA	31.3	31.1	33	31.80	1.04
	CR-CR	21.8	21.4	21.6	21.60	0.20
	MF-MF	47	46.2	45.9	46.37	0.57
	L-L	81	80.4	81.2	80.87	0.42
	AvRM-AvRM	55.2	55.4	55.2	55.27	0.12
RET- 21	IF-IF	46.9	47.4	46.9	47.07	0.29
	CRA-CRA	22.4	22.4	22.2	22.33	0.12
	GPF-GPF	26.5	27.1	26.3	26.63	0.42
	MRA-MRA	31.9	32	31.2	31.70	0.44
	CR-CR	21.1	20.4	21.6	21.03	0.60
	MF-MF	44.3	44	44.3	44.20	0.17
	L-L	74.7	76.3	74.5	75.17	0.99
	AvRM-AvRM	47.7	47.4	47.7	47.60	0.17
RET- 22	IF-IF	47	46.3	46.5	46.60	0.36
	CRA-CRA	22.7	22.7	23.1	22.83	0.23
	GPF-GPF	30	30.2	30.7	30.30	0.36
	MRA-MRA	32.6	31.7	32.6	32.30	0.52
	CR-CR	19	18.5	18.2	18.57	0.40
	MF-MF	47.4	46.2	46.7	46.77	0.60
	L-L	71.8	71.8	71.6	71.73	0.12
	AvRM-AvRM	44	44.1	44	44.03	0.06
RET- 23	IF-IF	57.6	57.6	57.8	57.67	0.12
	CRA-CRA	33.9	33.6	33.5	33.67	0.21
	GPF-GPF	31.7	32.4	32.1	32.07	0.35
	MRA-MRA	39	39.9	39.6	39.50	0.46
	CR-CR	22.1	21.8	23.6	22.50	0.96
	MF-MF	49.6	49.3	49	49.30	0.30
	L-L	85.5	83.2	83.8	84.17	1.19
	AvRM-AvRM	55.1	54.8	54.9	54.93	0.15
RET- 24	IF-IF	54.2	54.5	54.4	54.37	0.15
	CRA-CRA	19.9	19.7	19.3	19.63	0.31
	GPF-GPF	28.9	29.5	29.1	29.17	0.31

	MRA-MRA	35.4	35.5	35.4	35.43	0.06
	CR-CR	19.6	20.2	19.2	19.67	0.50
	MF-MF	45.5	46.8	45.8	46.03	0.68
	L-L	75.2	75.8	76.1	75.70	0.46
	AvRM-AvRM	52.1	52.2	51.9	52.07	0.15
RET- 25	IF-IF	63.6	63	62.8	63.13	0.42
	CRA-CRA	29.4	28.4	29.1	28.97	0.51
	GPF-GPF	28.2	28.3	28.7	28.40	0.26
	MRA-MRA	35.6	37.1	36.1	36.27	0.76
	CR-CR	20.5	19.5	20.1	20.03	0.50
	MF-MF	43.1	42.7	42.7	42.83	0.23
	L-L	78.5	77.8	78.3	78.20	0.36
	AvRM-AvRM	52.8	53.3	52.8	52.97	0.29
RET- 26	IF-IF	47.4	46.7	47.7	47.27	0.51
	CRA-CRA	29	29.9	29.2	29.37	0.47
	GPF-GPF	30.2	29.2	29.9	29.77	0.51
	MRA-MRA	33.7	31.9	32.3	32.63	0.95
	CR-CR	28.1	28.8	28.8	28.57	0.40
	MF-MF	46.4	46.7	47	46.70	0.30
	L-L	82.9	82.4	82.9	82.73	0.29
	AvRM-AvRM	51.6	51.8	52	51.80	0.20
RET- 27	IF-IF	48.5	48.5	49.2	48.73	0.40
	CRA-CRA	26.9	26.7	26.9	26.83	0.12
	GPF-GPF	29	28.3	28.3	28.53	0.40
	MRA-MRA	37.1	36.9	36.4	36.80	0.36
	CR-CR	20.7	21.8	20.4	20.97	0.74
	MF-MF	42.7	41.3	42	42.00	0.70
	L-L	78.4	77.5	77	77.63	0.71
	AvRM-AvRM	50.8	51.2	50.8	50.93	0.23
RET- 28	IF-IF	58.2	58.3	58.2	58.23	0.06
	CRA-CRA	26.8	27.1	28.5	27.47	0.91
	GPF-GPF	35.4	35.7	35.2	35.43	0.25
	MRA-MRA	38.9	39.5	39.2	39.20	0.30
	CR-CR	27.1	28.8	27.5	27.80	0.89
	MF-MF	50.7	50.4	51	50.70	0.30
	L-L	85	85.9	86.1	85.67	0.59
	AvRM-AvRM	54.4	54.6	54.9	54.63	0.25
RET- 29	IF-IF	64	63.8	63.7	63.83	0.15

	CRA-CRA	30.5	31.1	31.7	31.10	0.60
	GPF-GPF	30.3	30.3	30.6	30.40	0.17
	MRA-MRA	36.7	36.7	35.7	36.37	0.58
	CR-CR	21.5	21.4	22.4	21.77	0.55
	MF-MF	52.2	52.6	52.8	52.53	0.31
	L-L	83.7	83.7	83.9	83.77	0.12
	AvRM-AvRM	52.1	52.1	52.4	52.20	0.17
RET- 30	IF-IF	52.1	51.8	51.5	51.80	0.30
	CRA-CRA	28.6	28.4	28.6	28.53	0.12
	GPF-GPF	27.3	27.7	27.5	27.50	0.20
	MRA-MRA	35	35.2	34.1	34.77	0.59
	CR-CR	21.8	21.3	21.8	21.63	0.29
	MF-MF	39.4	39.5	38.7	39.20	0.44
	L-L	75.3	75.7	76.6	75.87	0.67
	AvRM-AvRM	49.5	49.9	49.9	49.77	0.23

	RATIOS (Anterior Width Ratio)				RATIOS (Posterior Width Ratio)			
Cl II-R Patients (1-30)	**IF:MF**	**IF: CR**	**CRA: MF**	**CRA:CR**	**GPF:L**	**GPF:AvRM**	**MRA:L**	**MRA:AvRM**
RET- 1	1.11	2.71	0.74	1.81	0.36	0.52	0.43	0.63
RET- 2	1.08	2.74	0.65	1.67	0.37	0.61	0.46	0.75
RET- 3	1.28	3.91	0.71	2.16	0.41	0.69	0.40	0.68
RET- 4	0.98	2.28	0.53	1.23	0.39	0.58	0.37	0.55
RET- 5	1.04	2.37	0.52	1.20	0.36	0.53	0.40	0.59
RET- 6	1.15	2.68	0.80	1.86	0.37	0.61	0.44	0.72
RET- 7	1.14	2.64	0.53	1.23	0.35	0.52	0.42	0.62
RET- 8	1.21	2.86	0.61	1.44	0.37	0.56	0.40	0.61
RET- 9	0.95	2.35	0.49	1.20	0.33	0.51	0.40	0.61
RET- 10	1.07	2.40	0.58	1.29	0.39	0.61	0.46	0.71
RET- 11	1.13	3.03	0.58	1.55	0.39	0.52	0.51	0.69
RET- 12	1.16	2.55	0.67	1.48	0.39	0.60	0.41	0.63
RET- 13	1.13	2.19	0.70	1.35	0.34	0.59	0.36	0.62
RET- 14	1.44	2.75	0.75	1.44	0.37	0.59	0.41	0.66
RET- 15	1.17	2.59	0.65	1.44	0.40	0.58	0.45	0.66
RET- 16	0.96	2.59	0.54	1.47	0.37	0.51	0.37	0.52
RET- 17	1.11	2.34	0.58	1.23	0.36	0.58	0.37	0.59
RET- 18	1.09	2.37	0.59	1.28	0.36	0.58	0.40	0.64
RET- 19	1.07	2.55	0.57	1.35	0.36	0.55	0.39	0.59
RET- 20	1.09	2.35	0.70	1.51	0.36	0.53	0.39	0.58
RET- 21	1.06	2.24	0.51	1.06	0.35	0.56	0.42	0.67
RET- 22	1.00	2.51	0.49	1.23	0.42	0.69	0.45	0.73
RET- 23	1.17	2.56	0.68	1.50	0.38	0.58	0.47	0.72
RET- 24	1.18	2.76	0.43	1.00	0.39	0.56	0.47	0.68
RET- 25	1.47	3.15	0.68	1.45	0.36	0.54	0.46	0.68
RET- 26	1.01	1.65	0.63	1.03	0.36	0.57	0.39	0.63
RET- 27	1.16	2.32	0.64	1.28	0.37	0.56	0.47	0.72
RET- 28	1.15	2.09	0.54	0.99	0.41	0.65	0.46	0.72
RET- 29	1.22	2.93	0.59	1.43	0.36	0.58	0.43	0.70
RET- 30	1.32	2.39	0.73	1.32	0.36	0.55	0.46	0.70
AVG	1.14	2.56	0.61	1.38	0.37	0.57	0.42	0.65
STDEV	0.12	0.39	0.09	0.26	0.02	0.05	0.04	0.06

CL II Mn Retrusive Patients						
	Landmark	**Raw Average**	**Std Dev**	**Max**	**Min**	**Intrarater reliability (avg std dev/pt)**
ANTERIOR	IF-IF	50.99	5.47	63.83	44.30	0.31
	CRA-CRA	27.45	3.64	33.67	19.63	0.44
	CR-CR	20.17	2.17	28.57	15.53	0.31
	MF-MF	44.98	3.24	52.53	37.37	0.37
POSTERIOR	GPF-GPF	29.52	2.77	35.43	26.63	0.45
	MRA-MRA	33.60	3.44	40.43	28.30	0.39
	L-L	79.27	3.36	85.67	71.73	0.46
	AvRM-AvRM	51.57	3.40	58.77	44.03	0.24

RATIOS (Anterior Mx/Mn Width Ratio)

	IF:MF	**IF: CR**	**CRA: MF**	**CRA:CR**
Average	1.14	2.56	0.61	1.38
St Dev	0.12	0.39	0.09	0.26
Maximum	1.47	3.91	0.80	2.16
Minimum	0.95	1.65	0.43	0.99

RATIOS (Posterior Mx/Mn Width Ratio)

	GPF:L	**GPF:AvRM**	**MRA:L**	**MRA:AvRM**
Average	0.37	0.57	0.42	0.65
St Dev	0.02	0.05	0.04	0.06
Maximum	0.42	0.69	0.51	0.75
Minimum	0.33	0.51	0.36	0.52

Anterior Landmarks:

1. Infraorbital foramina (IF)
2. Maxillary Canine root apices (CRA)
3. Mandibular Canine root apices (CR)
4. Mental Foramen (MF)

Posterior Landmarks:

1. Greater palatine foramina (GPF)
2. Maxillary first molar palatal root apices (MRA)
3. Lingula (L)
4. Alveolar Ridge at Mandibular First Molar (AvRM)

ANTERIOR MX/MN WIDTH RATIOS

	IF:MF				IF:CR		
	Class I	Class II-P	Class II-R		Class I	Class II-P	Class II-R
	0.91	0.96	0.95		1.76	1.82	1.65
	0.96	0.96	0.96		1.88	2.04	2.09
	0.96	1.01	0.98		1.91	2.08	2.19
	1.00	1.04	1.00		1.96	2.10	2.24
	1.00	1.05	1.01		2.01	2.18	2.28
	1.00	1.05	1.04		2.03	2.21	2.32
	1.00	1.05	1.06		2.11	2.23	2.34
	1.01	1.05	1.07		2.13	2.26	2.35
	1.01	1.06	1.07		2.13	2.37	2.35
	1.03	1.07	1.08		2.17	2.40	2.37
	1.05	1.08	1.09		2.17	2.42	2.37
	1.05	1.10	1.09		2.18	2.43	2.39
	1.07	1.10	1.11		2.21	2.44	2.40
	1.07	1.10	1.11		2.23	2.50	2.51
	1.07	1.10	1.13		2.31	2.53	2.55
	1.10	1.10	1.13		2.32	2.53	2.55
	1.11	1.11	1.14		2.37	2.61	2.56
	1.11	1.11	1.15		2.39	2.63	2.59
	1.12	1.11	1.15		2.47	2.63	2.59
	1.15	1.12	1.16		2.50	2.72	2.64
	1.16	1.13	1.16		2.53	2.72	2.68
	1.16	1.13	1.17		2.58	2.77	2.71
	1.17	1.14	1.17		2.58	2.85	2.74
	1.17	1.17	1.18		2.65	2.90	2.75
	1.18	1.18	1.21		2.75	2.95	2.76
	1.20	1.22	1.22		2.80	3.05	2.86
	1.24	1.22	1.28		2.90	3.11	2.93
	1.25	1.24	1.32		3.15	3.14	3.03
	1.27	1.25	1.44		3.27	3.50	3.15
	1.30	1.39	1.47		3.76	3.58	3.91
mean	1.10	1.11	1.14	mean	2.41	2.59	2.56
st dev	0.10	0.09	0.12	st dev	0.44	0.42	0.39
t test		0.48	0.16	t test		0.11	0.16

ANTERIOR MX/MN WIDTH RATIOS

	CRA:MF				CRA:CR		
	Class I	Class II-P	Class II-R		Class I	Class II-P	Class II-R
	0.48	0.41	0.43		1.12	0.92	0.99
	0.53	0.51	0.49		1.15	1.13	1.00
	0.56	0.55	0.49		1.16	1.20	1.03
	0.57	0.55	0.51		1.18	1.22	1.06
	0.58	0.56	0.52		1.18	1.25	1.20
	0.59	0.57	0.53		1.21	1.28	1.20
	0.59	0.58	0.53		1.21	1.32	1.23
	0.60	0.58	0.54		1.21	1.33	1.23
	0.61	0.59	0.54		1.23	1.34	1.23
	0.61	0.59	0.57		1.27	1.37	1.23
	0.61	0.62	0.58		1.27	1.37	1.28
	0.61	0.63	0.58		1.28	1.39	1.28
	0.61	0.64	0.58		1.29	1.41	1.29
	0.62	0.65	0.59		1.29	1.42	1.32
	0.63	0.65	0.59		1.31	1.42	1.35
	0.63	0.65	0.61		1.32	1.43	1.35
	0.63	0.66	0.63		1.33	1.45	1.43
	0.64	0.67	0.64		1.34	1.50	1.44
	0.64	0.68	0.65		1.39	1.50	1.44
	0.64	0.68	0.65		1.41	1.54	1.44
	0.64	0.68	0.67		1.49	1.55	1.45
	0.65	0.69	0.68		1.51	1.56	1.47
	0.67	0.69	0.68		1.54	1.57	1.48
	0.69	0.69	0.70		1.56	1.61	1.50
	0.72	0.69	0.70		1.57	1.68	1.51
	0.74	0.71	0.71		1.64	1.73	1.55
	0.74	0.72	0.73		1.68	1.78	1.67
	0.74	0.73	0.74		1.69	1.89	1.81
	0.76	0.73	0.75		1.83	1.98	1.86
	0.81	0.76	0.80		2.17	2.13	2.16
mean	0.64	0.64	0.61	mean	1.39	1.47	1.38
st dev	0.07	0.08	0.09	st dev	0.24	0.25	0.26
t test		0.93	0.25	t test		0.21	0.84

POSTERIOR MX/MN WIDTH RATIOS

	GPF:L				GPF:AvRM		
	Class I	Class II-P	Class II-R		Class I	Class II-P	Class II-R
	0.30	0.31	0.33		0.43	0.46	0.51
	0.32	0.31	0.34		0.44	0.51	0.51
	0.33	0.32	0.35		0.47	0.51	0.52
	0.33	0.33	0.35		0.49	0.52	0.52
	0.33	0.34	0.36		0.50	0.52	0.52
	0.33	0.34	0.36		0.51	0.52	0.53
	0.34	0.35	0.36		0.52	0.53	0.53
	0.34	0.35	0.36		0.52	0.53	0.54
	0.34	0.35	0.36		0.53	0.53	0.55
	0.34	0.35	0.36		0.53	0.53	0.55
	0.35	0.35	0.36		0.55	0.54	0.56
	0.36	0.35	0.36		0.55	0.54	0.56
	0.36	0.36	0.36		0.55	0.55	0.56
	0.37	0.36	0.36		0.55	0.56	0.56
	0.37	0.36	0.37		0.56	0.57	0.57
	0.37	0.36	0.37		0.57	0.57	0.58
	0.37	0.37	0.37		0.57	0.57	0.58
	0.37	0.37	0.37		0.58	0.57	0.58
	0.37	0.37	0.37		0.58	0.58	0.58
	0.37	0.37	0.37		0.58	0.59	0.58
	0.38	0.37	0.38		0.58	0.60	0.58
	0.38	0.38	0.39		0.61	0.60	0.59
	0.38	0.38	0.39		0.61	0.60	0.59
	0.38	0.38	0.39		0.61	0.61	0.60
	0.38	0.38	0.39		0.61	0.61	0.61
	0.38	0.39	0.39		0.62	0.62	0.61
	0.39	0.40	0.40		0.62	0.62	0.61
	0.39	0.40	0.41		0.63	0.63	0.65
	0.39	0.41	0.41		0.65	0.66	0.69
	0.40	0.42	0.42		0.65	0.66	0.69
mean	0.36	0.36	0.37	mean	0.56	0.57	0.57
st dev	0.03	0.03	0.02	st dev	0.06	0.05	0.05
t test		0.64	0.03	t test		0.53	0.26

POSTERIOR MX/MN WIDTH RATIOS

	MRA:L				MRA:AvRM		
	Class I	Class II-P	Class II-R		Class I	Class II-P	Class II-R
	0.33	0.35	0.36		0.49	0.56	0.52
	0.33	0.36	0.37		0.50	0.57	0.55
	0.34	0.38	0.37		0.54	0.58	0.58
	0.36	0.38	0.37		0.55	0.59	0.59
	0.37	0.38	0.39		0.56	0.61	0.59
	0.37	0.39	0.39		0.57	0.61	0.59
	0.38	0.39	0.39		0.58	0.61	0.61
	0.38	0.39	0.40		0.58	0.62	0.61
	0.38	0.39	0.40		0.58	0.62	0.62
	0.38	0.39	0.40		0.59	0.62	0.62
	0.39	0.40	0.40		0.59	0.62	0.63
	0.39	0.40	0.40		0.59	0.63	0.63
	0.39	0.41	0.41		0.59	0.64	0.63
	0.40	0.41	0.41		0.61	0.64	0.64
	0.41	0.41	0.42		0.63	0.65	0.66
	0.41	0.42	0.42		0.64	0.65	0.66
	0.41	0.43	0.43		0.65	0.65	0.67
	0.42	0.43	0.43		0.65	0.66	0.68
	0.43	0.43	0.44		0.66	0.67	0.68
	0.44	0.43	0.45		0.66	0.67	0.68
	0.44	0.44	0.45		0.67	0.68	0.69
	0.44	0.45	0.46		0.68	0.69	0.70
	0.44	0.45	0.46		0.70	0.69	0.70
	0.45	0.46	0.46		0.74	0.70	0.71
	0.45	0.46	0.46		0.74	0.70	0.72
	0.46	0.46	0.46		0.75	0.71	0.72
	0.50	0.46	0.47		0.75	0.74	0.72
	0.50	0.47	0.47		0.79	0.74	0.72
	0.51	0.49	0.47		0.80	0.76	0.73
	0.51	0.49	0.51		0.83	0.81	0.75
mean	0.41441	0.42	0.42	mean	0.64	0.66	0.65
st dev	0.050522	0.04	0.04	st dev	0.09	0.06	0.06
t test		0.61	0.41	t test		0.47	0.63

IF MF

Notes		
Output Created		16-MAY-2013 04:39:20
Comments		
Input	**Data**	F:\Waterman\ifmf.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		UNIANOVA ratio BY group /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /POSTHOC = group (TUKEY) /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /DESIGN = group .
Resources	**Elapsed Time**	0:00:01.22

Between-Subjects Factors		
		N
GROUP	**ClassI**	30
	ClassIIP	30
	ClassIIR	30

Descriptive Statistics Dependent Variable: RATIO			
GROUP	**Mean**	**Std. Deviation**	**N**
ClassI	1.0960	.1002	30
ClassIIP	1.1133	8.884E-02	30
ClassIIR	1.1367	.1223	30
Total	1.1153	.1049	90

Tests of Between-Subjects Effects Dependent Variable: RATIO					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**

Corrected Model	2.499E-02(a)	2	1.249E-02	1.140	.325
Intercept	111.957	1	111.957	10213.641	.000
GROUP	2.499E-02	2	1.249E-02	1.140	.325
Error	.954	87	1.096E-02		
Total	112.936	90			
Corrected Total	.979	89			

a R Squared = .026 (Adjusted R Squared = .003)

Post Hoc Tests

GROUP

Multiple Comparisons
Dependent Variable: RATIO
Tukey HSD

					95% Confidence Interval	
(I) GROUP	**(J) GROUP**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
ClassI	**ClassIIP**	-1.7333E-02	2.703E-02	.798	-8.1793E-02	4.713E-02
	ClassIIR	-4.0667E-02	2.703E-02	.294	-.1051	2.379E-02
ClassIIP	**ClassI**	1.733E-02	2.703E-02	.798	-4.7126E-02	8.179E-02
	ClassIIR	-2.3333E-02	2.703E-02	.665	-8.7793E-02	4.113E-02
ClassIIR	**ClassI**	4.067E-02	2.703E-02	.294	-2.3793E-02	.1051
	ClassIIP	2.333E-02	2.703E-02	.665	-4.1126E-02	8.779E-02

Based on observed means.

Homogeneous Subsets

RATIO
Tukey HSD

		Subset
GROUP	**N**	**1**
ClassI	30	1.0960

ClassIIP	30	1.1133
ClassIIR	30	1.1367
Sig.		.294
Means for groups in homogeneous subsets are displayed. Based on Type III Sum of Squares The error term is Mean Square(Error) = 1.096E-02.		
a Uses Harmonic Mean Sample Size = 30.000.		
b Alpha = .05.		

Explore

Notes		
Output Created		16-MAY-2013 04:40:16
Comments		
Input	**Data**	F:\Waterman\ifmf.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values for dependent variables are treated as missing. User-defined and system missing values for factors are treated as valid data.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ratio BY group /PLOT=BOXPLOT/STATISTICS=NONE/NOTOTAL /MISSING=REPORT.
Resources	**Elapsed Time**	0:00:00.19

GROUP

Case Processing Summary							
		Cases					
		Valid		**Missing**		**Total**	
	GROUP	**N**	**Percent**	**N**	**Percent**	**N**	**Percent**
RATIO	**ClassI**	30	100.0%	0	.0%	30	100.0%
	ClassIIP	30	100.0%	0	.0%	30	100.0%

	ClassIIR	30	100.0%	0	.0%	30	100.0%

RATIO

IF CR

Notes		
Output Created		16-MAY-2013 04:42:04
Comments		
Input	**Data**	F:\Waterman\ifcr.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		UNIANOVA ratio BY group /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /POSTHOC = group (TUKEY) /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /DESIGN = group .
Resources	**Elapsed Time**	0:00:00.32

Between-Subjects Factors		
		N
GROUP	**ClassI**	30
	ClassIIP	30
	ClassIIR	30

Descriptive Statistics Dependent Variable: RATIO

GROUP	Mean	Std. Deviation	N
ClassI	2.4070	.4444	30
ClassIIP	2.5900	.4185	30
ClassIIR	2.5617	.3923	30
Total	2.5196	.4220	90

Tests of Between-Subjects Effects
Dependent Variable: RATIO

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.582(a)	2	.291	1.659	.196
Intercept	571.334	1	571.334	3255.606	.000
GROUP	.582	2	.291	1.659	.196
Error	15.268	87	.175		
Total	587.184	90			
Corrected Total	15.850	89			

a R Squared = .037 (Adjusted R Squared = .015)

Post Hoc Tests

GROUP

Multiple Comparisons
Dependent Variable: RATIO
Tukey HSD

					95% Confidence Interval	
(I) GROUP	**(J) GROUP**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
ClassI	**ClassIIP**	-.1830	.1082	.214	-.4409	7.492E-02
	ClassIIR	-.1547	.1082	.330	-.4126	.1032
ClassIIP	**ClassI**	.1830	.1082	.214	-7.4917E-02	.4409
	ClassIIR	2.833E-02	.1082	.963	-.2296	.2862
ClassIIR	**ClassI**	.1547	.1082	.330	-.1032	.4126
	ClassIIP	-2.8333E-02	.1082	.963	-.2862	.2296

Based on observed means.

Homogeneous Subsets

RATIO
Tukey HSD

GROUP	N	Subset 1
ClassI	30	2.4070
ClassIIR	30	2.5617
ClassIIP	30	2.5900
Sig.		.214

Means for groups in homogeneous subsets are displayed.
Based on Type III Sum of Squares
The error term is Mean Square(Error) = .175.

a Uses Harmonic Mean Sample Size = 30.000.

b Alpha = .05.

Explore

Notes

Output Created		16-MAY-2013 04:42:33
Comments		
Input	**Data**	F:\Waterman\ifcr.sav
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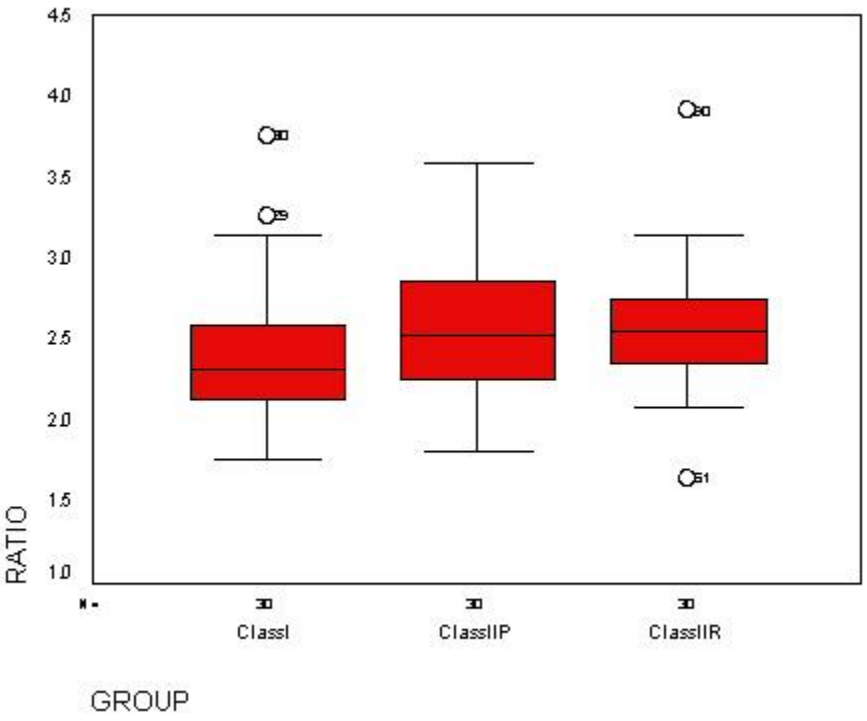
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values for dependent variables are treated as missing. User-defined and system missing values for factors are treated as valid data.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ratio BY group /PLOT=BOXPLOT/STATISTICS=NONE/NOTOTAL /MISSING=REPORT.
Resources	**Elapsed Time**	0:00:00.05

GROUP

Case Processing Summary							
		Cases					
		Valid		Missing		Total	
	GROUP	N	Percent	N	Percent	N	Percent
RATIO	ClassI	30	100.0%	0	.0%	30	100.0%
	ClassIIP	30	100.0%	0	.0%	30	100.0%
	ClassIIR	30	100.0%	0	.0%	30	100.0%

RATIO



CRA MF

Notes	
Output Created	16-MAY-2013 04:44:29
Comments	

Input	**Data**	F:\Waterman\cramf.sav
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		UNIANOVA ratio BY group /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /POSTHOC = group (TUKEY) /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /DESIGN = group .
Resources	**Elapsed Time**	0:00:00.32

Between-Subjects Factors

		N
GROUP	**ClassI**	30
	ClassIIP	30
	ClassIIR	30

Descriptive Statistics
Dependent Variable: RATIO

GROUP	Mean	Std. Deviation	N
ClassI	.6380	7.131E-02	30
ClassIIP	.6370	7.612E-02	30
ClassIIR	.6137	9.053E-02	30
Total	.6296	7.965E-02	90

Tests of Between-Subjects Effects
Dependent Variable: RATIO

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.138E-02(a)	2	5.688E-03	.894	.413
Intercept	35.671	1	35.671	5609.737	.000
GROUP	1.138E-02	2	5.688E-03	.894	.413
Error	.553	87	6.359E-03		
Total	36.235	90			
Corrected Total	.565	89			

a R Squared = .020 (Adjusted R Squared = -.002)

Post Hoc Tests

GROUP

Multiple Comparisons
Dependent Variable: RATIO
Tukey HSD

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
ClassI	**ClassIIP**	1.000E-03	2.059E-02	.999	-4.8095E-02	5.009E-02
	ClassIIR	2.433E-02	2.059E-02	.467	-2.4761E-02	7.343E-02
ClassIIP	**ClassI**	-1.0000E-03	2.059E-02	.999	-5.0095E-02	4.809E-02
	ClassIIR	2.333E-02	2.059E-02	.496	-2.5761E-02	7.243E-02
ClassIIR	**ClassI**	-2.4333E-02	2.059E-02	.467	-7.3428E-02	2.476E-02
	ClassIIP	-2.3333E-02	2.059E-02	.496	-7.2428E-02	2.576E-02

Based on observed means.

Homogeneous Subsets

RATIO
Tukey HSD

GROUP	N	Subset
		1
ClassIIR	30	.6137
ClassIIP	30	.6370
ClassI	30	.6380
Sig.		.467

Means for groups in homogeneous subsets are displayed.
Based on Type III Sum of Squares
The error term is Mean Square(Error) = 6.359E-03.

a Uses Harmonic Mean Sample Size = 30.000.

b Alpha = .05.

Explore

Notes		
Output Created		16-MAY-2013 04:44:47
Comments		
Input	**Data**	F:\Waterman\cramf.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values for dependent variables are treated as missing. User-defined and system missing values for factors are treated as valid data.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ratio BY group /PLOT=BOXPLOT/STATISTICS=NONE/NOTOTAL /MISSING=REPORT.
Resources	**Elapsed Time**	0:00:00.04

GROUP

Case Processing Summary							
		Cases					
		Valid		Missing		Total	
	GROUP	**N**	**Percent**	**N**	**Percent**	**N**	**Percent**
RATIO	**ClassI**	30	100.0%	0	.0%	30	100.0%
	ClassIIP	30	100.0%	0	.0%	30	100.0%
	ClassIIR	30	100.0%	0	.0%	30	100.0%

RATIO

CRA CR

Notes		
Output Created		16-MAY-2013 04:46:33
Comments		
Input	**Data**	F:\Waterman\cracr.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		UNIANOVA ratio BY group /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /POSTHOC = group (TUKEY) /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /DESIGN = group .
Resources	**Elapsed Time**	0:00:00.27

Between-Subjects Factors		
		N
GROUP	**ClassI**	30
	ClassIIP	30
	ClassIIR	30

Descriptive Statistics
Dependent Variable: RATIO

GROUP	Mean	Std. Deviation	N
ClassI	1.3943	.2363	30
ClassIIP	1.4757	.2535	30
ClassIIR	1.3827	.2569	30
Total	1.4176	.2497	90

Tests of Between-Subjects Effects
Dependent Variable: RATIO

Source	Type III Sum of Squares	df	Mean Square	F	Sig.

Corrected Model	.154(a)	2	7.700E-02	1.241	.294
Intercept	180.852	1	180.852	2915.418	.000
GROUP	.154	2	7.700E-02	1.241	.294
Error	5.397	87	6.203E-02		
Total	186.403	90			
Corrected Total	5.551	89			

a R Squared = .028 (Adjusted R Squared = .005)

Post Hoc Tests

GROUP

Multiple Comparisons
Dependent Variable: RATIO
Tukey HSD

					95% Confidence Interval	
(I) GROUP	**(J) GROUP**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
ClassI	**ClassIIP**	-8.1333E-02	6.431E-02	.419	-.2347	7.201E-02
	ClassIIR	1.167E-02	6.431E-02	.982	-.1417	.1650
ClassIIP	**ClassI**	8.133E-02	6.431E-02	.419	-7.2009E-02	.2347
	ClassIIR	9.300E-02	6.431E-02	.322	-6.0342E-02	.2463
ClassIIR	**ClassI**	-1.1667E-02	6.431E-02	.982	-.1650	.1417
	ClassIIP	-9.3000E-02	6.431E-02	.322	-.2463	6.034E-02

Based on observed means.

Homogeneous Subsets

RATIO
Tukey HSD

		Subset
GROUP	**N**	**1**
ClassIIR	30	1.3827

ClassI	30	1.3943
ClassIIP	30	1.4757
Sig.		.322
Means for groups in homogeneous subsets are displayed. Based on Type III Sum of Squares The error term is Mean Square(Error) = 6.203E-02.		
a Uses Harmonic Mean Sample Size = 30.000.		
b Alpha = .05.		

Explore

Notes		
Output Created		16-MAY-2013 04:46:56
Comments		
Input	**Data**	F:\Waterman\cracr.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values for dependent variables are treated as missing. User-defined and system missing values for factors are treated as valid data.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ratio BY group /PLOT=BOXPLOT/STATISTICS=NONE/NOTOTAL /MISSING=REPORT.
Resources	**Elapsed Time**	0:00:00.05

GROUP

Case Processing Summary							
		Cases					
		Valid		**Missing**		**Total**	
	GROUP	**N**	**Percent**	**N**	**Percent**	**N**	**Percent**
RATIO	**ClassI**	30	100.0%	0	.0%	30	100.0%
	ClassIIP	30	100.0%	0	.0%	30	100.0%

	ClassIIR	30	100.0%	0	.0%	30	100.0%

RATIO

GPF L

Notes		
Output Created		16-MAY-2013 05:16:09
Comments		
Input	**Data**	F:\Waterman\gpfl.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		UNIANOVA ratio BY group /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /POSTHOC = group (TUKEY) /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /DESIGN = group .
Resources	**Elapsed Time**	0:00:00.34

Between-Subjects Factors		
		N
GROUP	**ClassI**	30
	ClassIIP	30
	ClassIIR	30

Descriptive Statistics
Dependent Variable: RATIO

GROUP	Mean	Std. Deviation	N
ClassI	.3603	2.484E-02	30
ClassIIP	.3627	2.690E-02	30
ClassIIR	.3720	2.107E-02	30
Total	.3650	2.464E-02	90

Tests of Between-Subjects Effects
Dependent Variable: RATIO

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.287E-03(a)	2	1.143E-03	1.922	.153
Intercept	11.990	1	11.990	20152.330	.000
GROUP	2.287E-03	2	1.143E-03	1.922	.153
Error	5.176E-02	87	5.950E-04		
Total	12.044	90			
Corrected Total	5.405E-02	89			

a R Squared = .042 (Adjusted R Squared = .020)

Post Hoc Tests

GROUP

Multiple Comparisons
Dependent Variable: RATIO
Tukey HSD

					95% Confidence Interval	
(I) GROUP	**(J) GROUP**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
ClassI	**ClassIIP**	-2.3333E-03	6.298E-03	.927	-1.7351E-02	1.268E-02
	ClassIIR	-1.1667E-02	6.298E-03	.159	-2.6684E-02	3.351E-03
ClassIIP	**ClassI**	2.333E-03	6.298E-03	.927	-1.2684E-02	1.735E-02
	ClassIIR	-9.3333E-03	6.298E-03	.305	-2.4351E-02	5.684E-03
ClassIIR	**ClassI**	1.167E-02	6.298E-03	.159	-3.3510E-03	2.668E-02
	ClassIIP	9.333E-03	6.298E-03	.305	-5.6843E-03	2.435E-02

Based on observed means.

Homogeneous Subsets

RATIO
Tukey HSD

GROUP	N	Subset 1
ClassI	30	.3603
ClassIIP	30	.3627
ClassIIR	30	.3720
Sig.		.159

Means for groups in homogeneous subsets are displayed.
Based on Type III Sum of Squares
The error term is Mean Square(Error) = 5.950E-04.

a Uses Harmonic Mean Sample Size = 30.000.

b Alpha = .05.

Explore

Notes

Output Created		16-MAY-2013 05:16:30
Comments		
Input	**Data**	F:\Waterman\gpfl.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values for dependent variables are treated as missing. User-defined and system missing values for factors are treated as valid data.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ratio BY group /PLOT=BOXPLOT/STATISTICS=NONE/NOTOTAL /MISSING=REPORT.
Resources	**Elapsed Time**	0:00:00.06

GROUP

Case Processing Summary							
		Cases					
		Valid		Missing		Total	
	GROUP	N	Percent	N	Percent	N	Percent
RATIO	ClassI	30	100.0%	0	.0%	30	100.0%
	ClassIIP	30	100.0%	0	.0%	30	100.0%
	ClassIIR	30	100.0%	0	.0%	30	100.0%

RATIO

gpf a

Notes		
Output Created		16-MAY-2013 05:17:54
Comments		
Input	Data	F:\Waterman\gpfa.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		UNIANOVA ratio BY group /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /POSTHOC = group (TUKEY) /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /DESIGN = group .
Resources	Elapsed Time	0:00:00.24

Between-Subjects Factors		
		N
GROUP	ClassI	30
	ClassIIP	30
	ClassIIR	30

Descriptive Statistics Dependent Variable: RATIO			
GROUP	Mean	Std. Deviation	N
ClassI	.5590	5.750E-02	30
ClassIIP	.5670	4.786E-02	30
ClassIIR	.5737	4.620E-02	30
Total	.5666	5.055E-02	90

Tests of Between-Subjects Effects Dependent Variable: RATIO					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.236E-03(a)	2	1.618E-03	.628	.536
Intercept	28.889	1	28.889	11210.310	.000
GROUP	3.236E-03	2	1.618E-03	.628	.536
Error	.224	87	2.577E-03		
Total	29.116	90			
Corrected Total	.227	89			
a R Squared = .014 (Adjusted R Squared = -.008)					

Post Hoc Tests

GROUP

Multiple Comparisons Dependent Variable: RATIO Tukey HSD						
					95% Confidence Interval	
(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
ClassI	ClassIIP	-8.0000E-03	1.311E-02	.815	-3.9254E-02	2.325E-02

	ClassIIR	-1.4667E-02	1.311E-02	.505	-4.5921E-02	1.659E-02
ClassIIP	**ClassI**	8.000E-03	1.311E-02	.815	-2.3254E-02	3.925E-02
	ClassIIR	-6.6667E-03	1.311E-02	.867	-3.7921E-02	2.459E-02
ClassIIR	**ClassI**	1.467E-02	1.311E-02	.505	-1.6587E-02	4.592E-02
	ClassIIP	6.667E-03	1.311E-02	.867	-2.4587E-02	3.792E-02
Based on observed means.						

Homogeneous Subsets

RATIO
Tukey HSD

GROUP	**N**	**Subset**
		1
ClassI	30	.5590
ClassIIP	30	.5670
ClassIIR	30	.5737
Sig.		.505

Means for groups in homogeneous subsets are displayed.
Based on Type III Sum of Squares
The error term is Mean Square(Error) = 2.577E-03.

a Uses Harmonic Mean Sample Size = 30.000.

b Alpha = .05.

Explore

Notes

Output Created		16-MAY-2013 05:18:12
Comments		
Input	**Data**	F:\Waterman\gpfa.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing	**Definition of**	User-defined missing values for dependent variables are treated as missing.

Value Handling	**Missing**	User-defined and system missing values for factors are treated as valid data.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ratio BY group /PLOT=BOXPLOT/STATISTICS=NONE/NOTOTAL /MISSING=REPORT.
Resources	**Elapsed Time**	0:00:00.05

GROUP

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	GROUP	**N**	**Percent**	**N**	**Percent**	**N**	**Percent**
RATIO	**ClassI**	30	100.0%	0	.0%	30	100.0%
	ClassIIP	30	100.0%	0	.0%	30	100.0%
	ClassIIR	30	100.0%	0	.0%	30	100.0%

RATIO

MRA L

Notes

Output Created		16-MAY-2013 05:19:41
Comments		
Input	**Data**	F:\Waterman\mral.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all

		variables in the model.
Syntax		UNIANOVA ratio BY group /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /POSTHOC = group (TUKEY) /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /DESIGN = group .
Resources	**Elapsed Time**	0:00:00.30

Between-Subjects Factors

		N
GROUP	**ClassI**	30
	ClassIIP	30
	ClassIIR	30

Descriptive Statistics
Dependent Variable: RATIO

GROUP	Mean	Std. Deviation	N
ClassI	.4137	5.048E-02	30
ClassIIP	.4200	3.723E-02	30
ClassIIR	.4240	3.784E-02	30
Total	.4192	4.203E-02	90

Tests of Between-Subjects Effects
Dependent Variable: RATIO

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.629E-03(a)	2	8.144E-04	.455	.636
Intercept	15.817	1	15.817	8842.890	.000
GROUP	1.629E-03	2	8.144E-04	.455	.636
Error	.156	87	1.789E-03		
Total	15.975	90			
Corrected Total	.157	89			

a R Squared = .010 (Adjusted R Squared = -.012)

Post Hoc Tests

GROUP

Multiple Comparisons
Dependent Variable: RATIO
Tukey HSD

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
ClassI	**ClassIIP**	-6.3333E-03	1.092E-02	.831	-3.2372E-02	1.971E-02
	ClassIIR	-1.0333E-02	1.092E-02	.613	-3.6372E-02	1.571E-02
ClassIIP	**ClassI**	6.333E-03	1.092E-02	.831	-1.9705E-02	3.237E-02
	ClassIIR	-4.0000E-03	1.092E-02	.929	-3.0039E-02	2.204E-02
ClassIIR	**ClassI**	1.033E-02	1.092E-02	.613	-1.5705E-02	3.637E-02
	ClassIIP	4.000E-03	1.092E-02	.929	-2.2039E-02	3.004E-02

Based on observed means.

Homogeneous Subsets

RATIO
Tukey HSD

GROUP	N	Subset
		1
ClassI	30	.4137
ClassIIP	30	.4200
ClassIIR	30	.4240
Sig.		.613

Means for groups in homogeneous subsets are displayed.
Based on Type III Sum of Squares
The error term is Mean Square(Error) = 1.789E-03.

a Uses Harmonic Mean Sample Size = 30.000.

b Alpha = .05.

Explore

Notes	
Output Created	16-MAY-2013 05:20:04

Comments		
Input	**Data**	F:\Waterman\mral.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values for dependent variables are treated as missing. User-defined and system missing values for factors are treated as valid data.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ratio BY group /PLOT=BOXPLOT/STATISTICS=NONE/NOTOTAL /MISSING=REPORT.
Resources	**Elapsed Time**	0:00:00.05

GROUP

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	GROUP	**N**	**Percent**	**N**	**Percent**	**N**	**Percent**
RATIO	**ClassI**	30	100.0%	0	.0%	30	100.0%
	ClassIIP	30	100.0%	0	.0%	30	100.0%
	ClassIIR	30	100.0%	0	.0%	30	100.0%

RATIO

MRA A

Notes	
Output Created	16-MAY-2013 05:21:33

Comments		
Input	**Data**	F:\Waterman\mraa.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		UNIANOVA ratio BY group /METHOD = SSTYPE(3) /INTERCEPT = INCLUDE /POSTHOC = group (TUKEY) /PRINT = DESCRIPTIVE /CRITERIA = ALPHA(.05) /DESIGN = group .
Resources	**Elapsed Time**	0:00:00.25

Between-Subjects Factors

		N
GROUP	**ClassI**	30
	ClassIIP	30
	ClassIIR	30

Descriptive Statistics
Dependent Variable: RATIO

GROUP	Mean	Std. Deviation	N
ClassI	.6420	8.880E-02	30
ClassIIP	.6563	5.822E-02	30
ClassIIR	.6533	5.815E-02	30
Total	.6506	6.939E-02	90

Tests of Between-Subjects Effects
Dependent Variable: RATIO

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.429E-03(a)	2	1.714E-03	.351	.705
Intercept	38.090	1	38.090	7796.458	.000
GROUP	3.429E-03	2	1.714E-03	.351	.705
Error	.425	87	4.886E-03		
Total	38.518	90			

Corrected Total	.428	89			

a R Squared = .008 (Adjusted R Squared = -.015)

Post Hoc Tests

GROUP

Multiple Comparisons
Dependent Variable: RATIO
Tukey HSD

					95% Confidence Interval	
(I) GROUP	**(J) GROUP**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
ClassI	**ClassIIP**	-1.4333E-02	1.805E-02	.708	-5.7367E-02	2.870E-02
	ClassIIR	-1.1333E-02	1.805E-02	.805	-5.4367E-02	3.170E-02
ClassIIP	**ClassI**	1.433E-02	1.805E-02	.708	-2.8700E-02	5.737E-02
	ClassIIR	3.000E-03	1.805E-02	.985	-4.0034E-02	4.603E-02
ClassIIR	**ClassI**	1.133E-02	1.805E-02	.805	-3.1700E-02	5.437E-02
	ClassIIP	-3.0000E-03	1.805E-02	.985	-4.6034E-02	4.003E-02

Based on observed means.

Homogeneous Subsets

RATIO
Tukey HSD

	N	Subset
GROUP		**1**
ClassI	30	.6420
ClassIIR	30	.6533
ClassIIP	30	.6563
Sig.		.708

Means for groups in homogeneous subsets are displayed.
Based on Type III Sum of Squares
The error term is Mean Square(Error) = 4.886E-03.

a Uses Harmonic Mean Sample Size = 30.000.
b Alpha = .05.

Explore

Notes		
Output Created		16-MAY-2013 05:21:49
Comments		
Input	**Data**	F:\Waterman\mraa.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	90
Missing Value Handling	**Definition of Missing**	User-defined missing values for dependent variables are treated as missing. User-defined and system missing values for factors are treated as valid data.
	Cases Used	Statistics are based on cases with no missing values for any dependent variable or factor used.
Syntax		EXAMINE VARIABLES=ratio BY group /PLOT=BOXPLOT/STATISTICS=NONE/NOTOTAL /MISSING=REPORT.
Resources	**Elapsed Time**	0:00:00.05

GROUP

Case Processing Summary							
		Cases					
		Valid		Missing		Total	
	GROUP	**N**	**Percent**	**N**	**Percent**	**N**	**Percent**
RATIO	**ClassI**	30	100.0%	0	.0%	30	100.0%
	ClassIIP	30	100.0%	0	.0%	30	100.0%
	ClassIIR	30	100.0%	0	.0%	30	100.0%

RATIO

Inter-rater Reliability My Data

		Timepoint 1	Timepoint 2	Timepoint 3	Mean	SD
MAN II-01	IF-IF	43.80	43.80	44.40	44.00	0.35
	CRA-CRA	26.70	26.70	26.70	26.70	0.00
	GPF-GPF	26.70	26.70	26.20	26.53	0.29
	MRA-MRA	26.30	26.30	26.70	26.43	0.23
MAN II-02	IF-IF	49.70	48.20	49.30	49.07	0.78
	CRA-CRA	28.40	29.50	30.90	29.60	1.25
	GPF-GPF	28.60	29.00	28.70	28.77	0.21
	MRA-MRA	32.20	31.10	31.30	31.53	0.59
MAN II-03	IF-IF	43.80	44.80	44.50	44.37	0.51
	CRA-CRA	24.10	24.80	24.60	24.50	0.36
	GPF-GPF	26.70	26.00	26.90	26.53	0.47
	MRA-MRA	28.80	27.60	28.30	28.23	0.60
MAN II-04	IF-IF	53.50	52.90	53.60	53.33	0.38
	CRA-CRA	36.80	36.70	36.80	36.77	0.06
	GPF-GPF	31.20	30.50	31.00	30.90	0.36
	MRA-MRA	42.60	42.30	41.80	42.23	0.40
MAN II-05	IF-IF	56.90	57.60	56.90	57.13	0.40
	CRA-CRA	31.20	30.90	31.20	31.10	0.17
	GPF-GPF	31.20	31.00	31.40	31.20	0.20
	MRA-MRA	36.20	36.90	35.90	36.33	0.51
MAN II-06	IF-IF	45.90	44.60	44.80	45.10	0.70
	CRA-CRA	26.50	25.70	25.80	26.00	0.44
	GPF-GPF	25.50	26.00	25.80	25.77	0.25
	MRA-MRA	32.20	32.30	31.60	32.03	0.38
MAN II-07	IF-IF	52.20	52.20	52.20	52.20	0.00
	CRA-CRA	28.10	28.30	28.00	28.13	0.15
	GPF-GPF	30.70	30.40	30.40	30.50	0.17
	MRA-MRA	34.50	35.90	35.80	35.40	0.78
MAN II-08	IF-IF	49.50	48.60	48.60	48.90	0.52
	CRA-CRA	30.70	31.60	30.70	31.00	0.52
	GPF-GPF	29.90	29.00	29.20	29.37	0.47
	MRA-MRA	31.30	31.80	31.80	31.63	0.29

MAN II-09	IF-IF	49.40	49.10	49.50	49.33	0.21
	CRA-CRA	28.40	28.70	29.00	28.70	0.30
	GPF-GPF	29.60	29.40	29.20	29.40	0.20
	MRA-MRA	34.50	34.30	33.90	34.23	0.31
MAN II-10	IF-IF	50.30	50.80	50.50	50.53	0.25
	CRA-CRA	30.00	30.30	30.30	30.20	0.17
	GPF-GPF	31.00	31.50	31.30	31.27	0.25
	MRA-MRA	31.30	31.80	32.20	31.77	0.45
MAN II-11	IF-IF	50.60	51.90	51.80	51.43	0.72
	CRA-CRA	28.80	28.80	29.00	28.87	0.12
	GPF-GPF	32.50	31.50	31.90	31.97	0.50
	MRA-MRA	41.50	42.40	41.50	41.80	0.52
MAN II-12	IF-IF	42.90	43.00	43.50	43.13	0.32
	CRA-CRA	28.60	28.00	28.00	28.20	0.35
	GPF-GPF	30.30	30.10	30.30	30.23	0.12
	MRA-MRA	38.40	38.70	38.90	38.67	0.25
MAN II-13	IF-IF	56.60	56.80	57.30	56.90	0.36
	CRA-CRA	37.10	35.60	35.90	36.20	0.79
	GPF-GPF	32.30	31.50	31.80	31.87	0.40
	MRA-MRA	38.70	38.90	38.30	38.63	0.31
MAN II-14	IF-IF	51.60	50.20	52.20	51.33	1.03
	CRA-CRA	27.50	28.70	27.70	27.97	0.64
	GPF-GPF	26.70	26.10	25.70	26.17	0.50
	MRA-MRA	30.10	30.10	30.30	30.17	0.12
MAN II-15	IF-IF	46.50	47.40	47.80	47.23	0.67
	CRA-CRA	26.10	24.70	24.90	25.23	0.76
	GPF-GPF	25.90	25.30	25.10	25.43	0.42
	MRA-MRA	28.90	29.30	28.60	28.93	0.35
MAN II-16	IF-IF	47.60	48.00	48.30	47.97	0.35
	CRA-CRA	29.00	28.80	29.50	29.10	0.36
	GPF-GPF	27.60	27.40	27.60	27.53	0.12
	MRA-MRA	31.60	31.10	31.30	31.33	0.25
MAN II-17	IF-IF	53.20	53.20	53.60	53.33	0.23
	CRA-CRA	31.00	30.80	31.60	31.13	0.42
	GPF-GPF	26.80	28.30	28.10	27.73	0.81
	MRA-MRA	29.20	29.70	29.90	29.60	0.36

MAN II-18	IF-IF	42.60	42.60	42.60	42.60	0.00
	CRA-CRA	27.90	27.20	27.30	27.47	0.38
	GPF-GPF	26.80	26.10	25.90	26.27	0.47
	MRA-MRA	32.30	31.90	32.80	32.33	0.45
MAN II-19	IF-IF	60.20	58.50	59.30	59.33	0.85
	CRA-CRA	28.70	28.40	29.60	28.90	0.62
	GPF-GPF	32.80	33.10	32.80	32.90	0.17
	MRA-MRA	32.80	34.40	34.20	33.80	0.87
MAN II-20	IF-IF	50.30	51.60	50.80	50.90	0.66
	CRA-CRA	28.00	28.30	28.30	28.20	0.17
	GPF-GPF	32.10	32.40	32.40	32.30	0.17
	MRA-MRA	33.30	33.50	33.50	33.43	0.12
MAN II-21	IF-IF	54.50	54.90	54.20	54.53	0.35
	CRA-CRA	31.50	31.60	31.70	31.60	0.10
	GPF-GPF	33.30	32.80	33.50	33.20	0.36
	MRA-MRA	44.30	44.50	43.80	44.20	0.36
MAN II-22	IF-IF	44.80	46.50	45.90	45.73	0.86
	CRA-CRA	20.70	21.20	21.60	21.17	0.45
	GPF-GPF	25.50	25.50	25.70	25.57	0.12
	MRA-MRA	30.30	29.70	29.90	29.97	0.31
MAN II-23	IF-IF	41.30	40.50	41.50	41.10	0.53
	CRA-CRA	30.80	30.40	29.60	30.27	0.61
	GPF-GPF	22.20	22.40	22.60	22.40	0.20
	MRA-MRA	30.00	30.40	29.60	30.00	0.40
MAN II-24	IF-IF	48.80	48.90	49.20	48.97	0.21
	CRA-CRA	28.40	28.10	29.30	28.60	0.62
	GPF-GPF	30.00	30.50	30.00	30.17	0.29
	MRA-MRA	31.00	31.90	31.20	31.37	0.47
MAN II-25	IF-IF	54.00	53.60	52.60	53.40	0.72
	CRA-CRA	28.90	28.60	29.00	28.83	0.21
	GPF-GPF	30.60	31.50	31.40	31.17	0.49
	MRA-MRA	36.00	35.40	36.20	35.87	0.42
MAN II-26	IF-IF	49.60	49.80	49.80	49.73	0.12
	CRA-CRA	25.60	24.50	25.10	25.07	0.55
	GPF-GPF	29.20	29.50	29.10	29.27	0.21
	MRA-MRA	25.50	25.50	25.40	25.47	0.06

MAN II-27	IF-IF	38.40	39.30	38.40	38.70	0.52
	CRA-CRA	26.20	26.40	27.30	26.63	0.59
	GPF-GPF	23.20	23.20	23.40	23.27	0.12
	MRA-MRA	26.00	26.20	26.70	26.30	0.36
MAN II-28	IF-IF	47.70	48.90	47.70	48.10	0.69
	CRA-CRA	26.70	26.30	26.30	26.43	0.23
	GPF-GPF	26.50	26.10	26.50	26.37	0.23
	MRA-MRA	37.00	37.00	37.20	37.07	0.12
MAN II-29	IF-IF	50.70	50.30	51.10	50.70	0.40
	CRA-CRA	29.20	29.60	29.40	29.40	0.20
	GPF-GPF	32.20	32.40	32.50	32.37	0.15
	MRA-MRA	36.10	35.60	36.70	36.13	0.55
MAN II-30	IF-IF	46.20	46.80	46.60	46.53	0.31
	CRA-CRA	26.00	26.00	25.40	25.80	0.35
	GPF-GPF	28.70	28.90	28.90	28.83	0.12
	MRA-MRA	31.70	32.40	32.60	32.23	0.47

Inter-rater Reliability Rater 1

	Timepoint 1	Timepoint 2	Timepoint 3	Mean	SD
IF-IF	44.30	44.70	43.60	44.20	0.56
CRA-CRA	25.30	26.60	26.50	26.13	0.72
GPF-GPF	25.60	26.10	26.40	26.03	0.40
MRA-MRA	26.50	26.90	25.40	26.27	0.78
IF-IF	44.60	45.90	46.30	45.60	0.89
CRA-CRA	27.00	27.10	27.00	27.03	0.06
GPF-GPF	28.70	28.40	28.50	28.53	0.15
MRA-MRA	32.60	30.50	31.30	31.47	1.06
IF-IF	47.80	47.80	46.80	47.47	0.58
CRA-CRA	22.90	23.50	23.50	23.30	0.35
GPF-GPF	26.50	26.60	26.20	26.43	0.21
MRA-MRA	28.50	28.30	28.40	28.40	0.10
IF-IF	54.50	54.10	52.80	53.80	0.89
CRA-CRA	34.90	34.20	34.20	34.43	0.40
GPF-GPF	32.00	31.00	31.20	31.40	0.53
MRA-MRA	42.00	41.70	41.90	41.87	0.15
IF-IF	59.50	59.60	60.00	59.70	0.26
CRA-CRA	28.50	27.90	29.00	28.47	0.55
GPF-GPF	30.80	31.00	31.20	31.00	0.20
MRA-MRA	34.20	36.10	37.00	35.77	1.43
IF-IF	45.40	45.20	44.50	45.03	0.47
CRA-CRA	25.20	26.00	25.00	25.40	0.53
GPF-GPF	26.60	26.20	26.20	26.33	0.23
MRA-MRA	32.20	32.80	31.80	32.27	0.50
IF-IF	52.20	52.50	52.20	52.30	0.17
CRA-CRA	27.40	27.80	27.60	27.60	0.20
GPF-GPF	31.00	30.90	30.90	30.93	0.06
MRA-MRA	32.50	32.30	33.80	32.87	0.81
IF-IF	48.20	47.80	48.80	48.27	0.50
CRA-CRA	30.20	28.30	28.90	29.13	0.97
GPF-GPF	28.90	28.70	29.30	28.97	0.31
MRA-MRA	31.30	31.90	32.50	31.90	0.60

IF-IF	48.80	48.60	48.40	48.60	0.20
CRA-CRA	25.80	26.40	25.40	25.87	0.50
GPF-GPF	28.60	28.60	28.90	28.70	0.17
MRA-MRA	35.10	34.70	34.40	34.73	0.35
IF-IF	51.30	51.10	51.70	51.37	0.31
CRA-CRA	28.80	29.60	30.20	29.53	0.70
GPF-GPF	32.00	30.90	31.40	31.43	0.55
MRA-MRA	30.60	31.50	31.20	31.10	0.46
IF-IF	52.20	52.30	52.70	52.40	0.26
CRA-CRA	27.00	27.30	27.40	27.23	0.21
GPF-GPF	32.90	32.40	32.20	32.50	0.36
MRA-MRA	42.20	40.90	41.60	41.57	0.65
IF-IF	46.70	46.20	45.60	46.17	0.55
CRA-CRA	27.00	27.20	27.40	27.20	0.20
GPF-GPF	30.00	30.00	29.70	29.90	0.17
MRA-MRA	37.80	38.50	38.70	38.33	0.47
IF-IF	60.10	59.30	58.40	59.27	0.85
CRA-CRA	32.00	31.50	31.90	31.80	0.26
GPF-GPF	32.20	31.30	32.10	31.87	0.49
MRA-MRA	37.20	37.00	37.60	37.27	0.31
IF-IF	54.20	53.50	54.70	54.13	0.60
CRA-CRA	27.80	27.50	27.50	27.60	0.17
GPF-GPF	27.10	27.10	26.50	26.90	0.35
MRA-MRA	29.50	30.20	30.80	30.17	0.65
IF-IF	47.10	47.40	46.50	47.00	0.46
CRA-CRA	23.40	23.20	23.30	23.30	0.10
GPF-GPF	26.50	24.90	25.30	25.57	0.83
MRA-MRA	28.90	28.40	28.80	28.70	0.26
IF-IF	53.60	53.20	52.40	53.07	0.61
CRA-CRA	26.70	26.40	26.40	26.50	0.17
GPF-GPF	27.00	26.40	26.20	26.53	0.42
MRA-MRA	32.40	33.50	33.50	33.13	0.64
IF-IF	51.70	51.70	52.30	51.90	0.35
CRA-CRA	31.90	31.70	30.80	31.47	0.59
GPF-GPF	27.80	28.60	28.20	28.20	0.40
MRA-MRA	29.20	29.30	30.40	29.63	0.67

IF-IF	43.10	42.90	42.90	42.97	0.12
CRA-CRA	26.70	28.10	26.80	27.20	0.78
GPF-GPF	26.00	26.20	26.00	26.07	0.12
MRA-MRA	31.40	30.40	31.20	31.00	0.53
IF-IF	57.60	57.40	57.00	57.33	0.31
CRA-CRA	27.90	28.40	28.60	28.30	0.36
GPF-GPF	33.70	33.50	32.90	33.37	0.42
MRA-MRA	35.70	35.00	35.30	35.33	0.35
IF-IF	55.40	55.00	55.00	55.13	0.23
CRA-CRA	25.90	26.60	26.80	26.43	0.47
GPF-GPF	31.90	32.20	32.10	32.07	0.15
MRA-MRA	33.20	34.10	33.30	33.53	0.49
IF-IF	55.90	55.90	55.50	55.77	0.23
CRA-CRA	30.90	29.70	30.90	30.50	0.69
GPF-GPF	34.10	33.50	33.70	33.77	0.31
MRA-MRA	45.70	45.50	45.00	45.40	0.36
IF-IF	45.50	45.50	45.90	45.63	0.23
CRA-CRA	20.70	20.70	20.50	20.63	0.12
GPF-GPF	25.20	25.00	25.20	25.13	0.12
MRA-MRA	30.00	30.00	29.80	29.93	0.12
IF-IF	42.60	43.10	42.50	42.73	0.32
CRA-CRA	28.80	29.00	28.20	28.67	0.42
GPF-GPF	23.00	22.90	22.50	22.80	0.26
MRA-MRA	29.50	30.40	30.20	30.03	0.47
IF-IF	48.50	48.10	48.90	48.50	0.40
CRA-CRA	27.30	27.50	27.50	27.43	0.12
GPF-GPF	30.70	30.10	30.70	30.50	0.35
MRA-MRA	31.30	31.70	31.70	31.57	0.23
IF-IF	53.40	53.80	53.20	53.47	0.31
CRA-CRA	28.70	28.70	28.40	28.60	0.17
GPF-GPF	31.30	31.30	30.50	31.03	0.46
MRA-MRA	35.00	36.20	36.00	35.73	0.64
IF-IF	47.00	46.70	47.60	47.10	0.46
CRA-CRA	25.40	23.80	23.60	24.27	0.99
GPF-GPF	29.00	29.00	29.10	29.03	0.06
MRA-MRA	26.20	25.60	26.00	25.93	0.31

IF-IF	42.10	41.50	41.60	41.73	0.32
CRA-CRA	26.10	26.30	26.40	26.27	0.15
GPF-GPF	23.50	23.40	23.00	23.30	0.26
MRA-MRA	25.30	25.80	25.10	25.40	0.36
IF-IF	46.30	47.40	47.80	47.17	0.78
CRA-CRA	25.60	26.00	27.00	26.20	0.72
GPF-GPF	26.20	26.40	26.20	26.27	0.12
MRA-MRA	38.40	37.80	37.10	37.77	0.65
IF-IF	49.90	50.70	51.90	50.83	1.01
CRA-CRA	30.20	30.10	29.00	29.77	0.67
GPF-GPF	32.40	32.00	32.80	32.40	0.40
MRA-MRA	37.00	36.40	36.90	36.77	0.32
IF-IF	48.60	48.80	48.40	48.60	0.20
CRA-CRA	24.70	24.20	25.00	24.63	0.40
GPF-GPF	27.90	27.90	28.60	28.13	0.40
MRA-MRA	32.60	32.20	32.80	32.53	0.31

Inter-rater Reliability My Data

	Timepoint 1	Timepoint 2	Timepoint 3	Mean	SD
CR-CR	17.00	17.30	17.80	17.37	0.40
MF-MF	44.10	43.90	43.60	43.87	0.25
L-L	80.00	81.00	80.00	80.33	0.58
AvRM-AvRM	48.00	47.70	47.30	47.67	0.35
CR-CR	25.10	24.80	25.30	25.07	0.25
MF-MF	45.80	46.10	45.80	45.90	0.17
L-L	82.30	82.90	83.20	82.80	0.46
AvRM-AvRM	56.30	55.10	54.90	55.43	0.76
CR-CR	20.90	20.90	20.60	20.80	0.17
MF-MF	44.30	44.10	43.60	44.00	0.36
L-L	73.50	71.40	71.60	72.17	1.16
AvRM-AvRM	48.10	48.10	48.70	48.30	0.35
CR-CR	16.30	17.70	16.80	16.93	0.71
MF-MF	44.30	44.50	47.60	45.47	1.85
L-L	84.10	84.20	83.60	83.97	0.32
AvRM-AvRM	53.50	53.60	53.80	53.63	0.15
CR-CR	23.20	22.80	23.50	23.17	0.35
MF-MF	48.30	48.60	48.30	48.40	0.17
L-L	85.60	86.00	84.00	85.20	1.06
AvRM-AvRM	52.20	51.50	51.00	51.57	0.60
CR-CR	19.80	19.60	19.10	19.50	0.36
MF-MF	43.50	42.80	42.60	42.97	0.47
L-L	70.00	70.30	70.00	70.10	0.17
AvRM-AvRM	50.70	50.60	51.30	50.87	0.38
CR-CR	22.00	22.00	21.50	21.83	0.29
MF-MF	46.70	46.10	46.70	46.50	0.35
L-L	80.70	78.70	81.00	80.13	1.25
AvRM-AvRM	53.90	53.70	54.00	53.87	0.15
CR-CR	25.80	25.60	25.30	25.57	0.25
MF-MF	48.60	49.70	49.10	49.13	0.55
L-L	82.90	82.30	81.80	82.33	0.55
AvRM-AvRM	52.50	53.80	54.20	53.50	0.89

CR-CR	22.50	22.00	23.30	22.60	0.66
MF-MF	44.80	44.60	45.00	44.80	0.20
L-L	77.30	77.50	76.90	77.23	0.31
AvRM-AvRM	53.90	53.60	53.20	53.57	0.35
CR-CR	23.00	22.80	22.70	22.83	0.15
MF-MF	41.70	42.20	42.00	41.97	0.25
L-L	82.90	83.50	82.90	83.10	0.35
AvRM-AvRM	54.30	54.00	54.30	54.20	0.17
CR-CR	19.70	20.60	21.30	20.53	0.80
MF-MF	48.20	48.20	47.80	48.07	0.23
L-L	82.30	80.90	81.90	81.70	0.72
AvRM-AvRM	52.30	52.50	51.80	52.20	0.36
CR-CR	21.80	20.90	21.80	21.50	0.52
MF-MF	45.20	44.90	44.70	44.93	0.25
L-L	77.20	76.50	76.70	76.80	0.36
AvRM-AvRM	52.20	52.10	51.70	52.00	0.26
CR-CR	22.00	21.80	20.60	21.47	0.76
MF-MF	49.20	48.50	49.40	49.03	0.47
L-L	86.30	86.00	86.00	86.10	0.17
AvRM-AvRM	51.80	52.50	52.40	52.23	0.38
CR-CR	21.10	22.10	21.90	21.70	0.53
MF-MF	44.60	44.40	44.80	44.60	0.20
L-L	79.10	78.50	78.70	78.77	0.31
AvRM-AvRM	55.70	55.20	55.40	55.43	0.25
CR-CR	22.00	22.20	21.20	21.80	0.53
MF-MF	42.20	42.70	42.70	42.53	0.29
L-L	75.80	74.80	74.60	75.07	0.64
AvRM-AvRM	51.40	51.40	51.80	51.53	0.23
CR-CR	17.50	19.50	18.70	18.57	1.01
MF-MF	44.90	44.90	44.70	44.83	0.12
L-L	84.10	84.30	84.60	84.33	0.25
AvRM-AvRM	52.70	52.80	53.20	52.90	0.26
CR-CR	19.10	19.40	18.60	19.03	0.40
MF-MF	41.00	41.10	40.80	40.97	0.15
L-L	81.40	81.70	81.60	81.57	0.15
AvRM-AvRM	45.10	45.10	44.90	45.03	0.12

CR-CR	22.00	22.90	23.10	22.67	0.59
MF-MF	42.40	42.90	42.60	42.63	0.25
L-L	78.40	77.80	78.00	78.07	0.31
AvRM-AvRM	50.10	49.20	49.20	49.50	0.52
CR-CR	15.60	15.90	15.90	15.80	0.17
MF-MF	50.60	51.00	50.60	50.73	0.23
L-L	90.60	90.80	90.60	90.67	0.12
AvRM-AvRM	52.10	52.10	52.70	52.30	0.35
CR-CR	22.90	23.50	22.20	22.87	0.65
MF-MF	40.60	40.60	40.90	40.70	0.17
L-L	82.10	82.10	81.70	81.97	0.23
AvRM-AvRM	49.90	49.70	49.90	49.83	0.12
CR-CR	18.70	18.60	19.10	18.80	0.26
MF-MF	52.10	52.10	52.30	52.17	0.12
L-L	87.50	86.90	88.10	87.50	0.60
AvRM-AvRM	53.40	53.60	53.40	53.47	0.12
CR-CR	13.70	14.40	13.90	14.00	0.36
MF-MF	44.40	43.90	44.60	44.30	0.36
L-L	75.30	75.60	75.30	75.40	0.17
AvRM-AvRM	50.40	51.90	51.60	51.30	0.79
CR-CR	19.50	19.70	19.10	19.43	0.31
MF-MF	40.50	40.70	41.10	40.77	0.31
L-L	68.60	68.20	68.60	68.47	0.23
AvRM-AvRM	51.80	50.80	51.40	51.33	0.50
CR-CR	22.30	21.60	23.70	22.53	1.07
MF-MF	49.30	48.80	49.50	49.20	0.36
L-L	80.50	79.50	79.80	79.93	0.51
AvRM-AvRM	52.60	52.80	52.80	52.73	0.12
CR-CR	24.70	25.50	25.10	25.10	0.40
MF-MF	43.40	43.20	42.80	43.13	0.31
L-L	84.30	84.30	85.30	84.63	0.58
AvRM-AvRM	47.70	47.70	47.40	47.60	0.17
CR-CR	18.20	17.90	18.10	18.07	0.15
MF-MF	43.10	42.50	42.60	42.73	0.32
L-L	77.50	77.30	77.30	77.37	0.12
AvRM-AvRM	50.80	50.60	50.80	50.73	0.12

CR-CR	21.80	21.70	22.40	21.97	0.38
MF-MF	43.20	42.10	42.60	42.63	0.55
L-L	77.10	78.10	78.20	77.80	0.61
AvRM-AvRM	54.20	53.00	53.60	53.60	0.60
CR-CR	23.60	24.00	23.40	23.67	0.31
MF-MF	43.40	43.40	42.80	43.20	0.35
L-L	82.20	82.30	81.60	82.03	0.38
AvRM-AvRM	49.40	49.40	49.40	49.40	0.00
CR-CR	19.60	20.10	19.30	19.67	0.40
MF-MF	39.90	40.40	39.50	39.93	0.45
L-L	81.20	81.50	81.00	81.23	0.25
AvRM-AvRM	53.80	52.80	52.10	52.90	0.85
CR-CR	20.10	20.80	19.40	20.10	0.70
MF-MF	48.80	48.40	48.80	48.67	0.23
L-L	78.50	78.70	78.10	78.43	0.31
AvRM-AvRM	52.30	52.80	52.30	52.47	0.29

Inter-rater Reliability Rater 2

	Timepoint 1	Timepoint 2	Timepoint 3	Mean	SD
CR-CR	17.30	17.00	17.00	17.10	0.17
MF-MF	46.10	46.10	45.80	46.00	0.17
L-L	78.50	78.80	78.40	78.57	0.21
AvRM-AvRM	47.80	47.50	47.40	47.57	0.21
CR-CR	23.50	22.70	23.60	23.27	0.49
MF-MF	47.20	49.30	48.40	48.30	1.05
L-L	79.60	79.00	79.60	79.40	0.35
AvRM-AvRM	55.90	55.40	55.30	55.53	0.32
CR-CR	20.50	20.10	19.60	20.07	0.45
MF-MF	50.70	50.10	52.10	50.97	1.03
L-L	80.50	80.70	81.20	80.80	0.36
AvRM-AvRM	54.40	53.70	53.90	54.00	0.36
CR-CR	16.30	15.90	17.30	16.50	0.72
MF-MF	47.00	46.30	48.40	47.23	1.07
L-L	84.60	82.40	82.10	83.03	1.37
AvRM-AvRM	54.60	54.30	54.10	54.33	0.25
CR-CR	24.00	24.00	22.10	23.37	1.10
MF-MF	51.00	51.30	52.20	51.50	0.62
L-L	81.30	82.90	81.80	82.00	0.82
AvRM-AvRM	53.30	51.30	52.60	52.40	1.01
CR-CR	19.50	18.20	19.30	19.00	0.70
MF-MF	43.10	44.20	43.50	43.60	0.56
L-L	67.20	67.90	67.50	67.53	0.35
AvRM-AvRM	49.90	49.10	49.30	49.43	0.42
CR-CR	22.90	22.60	21.10	22.20	0.96
MF-MF	48.90	48.20	48.60	48.57	0.35
L-L	80.20	80.10	80.00	80.10	0.10
AvRM-AvRM	54.50	55.00	54.30	54.60	0.36
CR-CR	24.60	24.80	24.80	24.73	0.12
MF-MF	50.20	50.00	50.00	50.07	0.12
L-L	79.70	79.50	79.50	79.57	0.12

AvRM-AvRM	53.90	53.70	54.60	54.07	0.47
CR-CR	21.40	21.50	20.40	21.10	0.61
MF-MF	46.50	46.00	46.70	46.40	0.36
L-L	75.80	75.30	76.00	75.70	0.36
AvRM-AvRM	53.90	53.00	52.50	53.13	0.71
CR-CR	19.70	17.80	17.20	18.23	1.31
MF-MF	49.30	49.00	48.40	48.90	0.46
L-L	77.70	76.90	76.70	77.10	0.53
AvRM-AvRM	50.40	50.80	50.60	50.60	0.20
CR-CR	19.80	19.40	19.60	19.60	0.20
MF-MF	49.70	50.40	49.30	49.80	0.56
L-L	78.80	78.10	78.10	78.33	0.40
AvRM-AvRM	53.10	53.10	52.90	53.03	0.12
CR-CR	21.40	22.30	21.30	21.67	0.55
MF-MF	46.70	45.50	45.70	45.97	0.64
L-L	76.20	75.50	75.80	75.83	0.35
AvRM-AvRM	53.70	54.10	53.20	53.67	0.45
CR-CR	22.90	21.60	21.40	21.97	0.81
MF-MF	44.00	42.90	42.40	43.10	0.82
L-L	81.50	81.30	80.90	81.23	0.31
AvRM-AvRM	55.30	54.80	54.80	54.97	0.29
CR-CR	21.20	20.10	20.50	20.60	0.56
MF-MF	45.10	45.20	44.90	45.07	0.15
L-L	75.40	74.70	74.70	74.93	0.40
AvRM-AvRM	53.80	54.20	54.20	54.07	0.23
CR-CR	20.20	19.20	19.50	19.63	0.51
MF-MF	43.60	44.00	44.00	43.87	0.23
L-L	71.60	70.90	71.40	71.30	0.36
AvRM-AvRM	50.90	50.50	50.90	50.77	0.23
CR-CR	15.70	16.70	16.40	16.27	0.51
MF-MF	41.80	43.90	45.00	43.57	1.63
L-L	84.00	83.20	84.00	83.73	0.46
AvRM-AvRM	52.30	52.30	51.90	52.17	0.23
CR-CR	18.00	17.40	17.90	17.77	0.32
MF-MF	42.60	42.40	42.10	42.37	0.25
L-L	78.50	78.90	78.90	78.77	0.23

AvRM-AvRM	46.30	45.70	46.40	46.13	0.38
CR-CR	22.50	20.10	19.80	20.80	1.48
MF-MF	47.60	46.60	46.50	46.90	0.61
L-L	79.70	79.80	80.10	79.87	0.21
AvRM-AvRM	54.00	52.70	53.00	53.23	0.68
CR-CR	15.40	15.60	14.80	15.27	0.42
MF-MF	52.60	55.00	53.50	53.70	1.21
L-L	88.00	88.20	88.50	88.23	0.25
AvRM-AvRM	52.80	53.70	53.00	53.17	0.47
CR-CR	17.40	17.10	17.60	17.37	0.25
MF-MF	45.20	45.30	44.60	45.03	0.38
L-L	76.30	76.50	76.30	76.37	0.12
AvRM-AvRM	51.40	51.70	51.00	51.37	0.35
CR-CR	18.70	18.10	18.90	18.57	0.42
MF-MF	49.70	50.10	48.80	49.53	0.67
L-L	85.40	85.60	85.80	85.60	0.20
AvRM-AvRM	54.50	53.70	53.70	53.97	0.46
CR-CR	14.60	13.40	13.40	13.80	0.69
MF-MF	48.00	47.90	45.50	47.13	1.42
L-L	78.10	75.70	72.80	75.53	2.65
AvRM-AvRM	51.30	51.70	50.80	51.27	0.45
CR-CR	18.00	18.20	18.50	18.23	0.25
MF-MF	43.60	43.10	43.40	43.37	0.25
L-L	67.60	67.90	68.30	67.93	0.35
AvRM-AvRM	51.50	51.00	50.40	50.97	0.55
CR-CR	19.30	19.80	20.10	19.73	0.40
MF-MF	51.50	50.30	51.10	50.97	0.61
L-L	77.20	77.40	78.00	77.53	0.42
AvRM-AvRM	53.20	53.60	53.80	53.53	0.31
CR-CR	24.20	23.70	22.70	23.53	0.76
MF-MF	43.30	45.70	46.60	45.20	1.71
L-L	81.90	81.80	81.70	81.80	0.10
AvRM-AvRM	48.30	48.40	48.30	48.33	0.06
CR-CR	17.40	17.80	17.60	17.60	0.20
MF-MF	44.70	43.00	44.10	43.93	0.86
L-L	74.60	77.00	75.90	75.83	1.20

AvRM-AvRM	51.40	50.10	50.00	50.50	0.78
CR-CR	21.00	21.10	20.50	20.87	0.32
MF-MF	43.50	45.00	45.20	44.57	0.93
L-L	74.70	74.40	74.40	74.50	0.17
AvRM-AvRM	52.90	52.60	52.40	52.63	0.25
CR-CR	22.00	22.80	22.20	22.33	0.42
MF-MF	45.70	47.20	44.50	45.80	1.35
L-L	81.80	78.20	77.40	79.13	2.34
AvRM-AvRM	50.80	51.60	50.80	51.07	0.46
CR-CR	15.30	14.80	19.40	16.50	2.52
MF-MF	44.20	44.30	38.90	42.47	3.09
L-L	83.00	82.10	84.60	83.23	1.27
AvRM-AvRM	54.50	56.10	54.90	55.17	0.83
CR-CR	18.50	19.00	19.20	18.90	0.36
MF-MF	50.50	51.00	51.10	50.87	0.32
L-L	75.50	75.10	74.60	75.07	0.45
AvRM-AvRM	52.60	52.60	52.10	52.43	0.29

Intra-Rater Reliability Measurements

Landmarks	Timepoint 1	Timepoint 2	Timepoint 3	Mean	SD
IF-IF	43.8	43.8	44.4	44.00	0.35
CRA-CRA	26.7	26.7	26.7	26.70	0.00
GPF-GPF	26.7	26.7	26.2	26.53	0.29
MRA-MRA	26.3	26.3	26.7	26.43	0.23
CR-CR	17	17.3	17.8	17.37	0.40
MF-MF	44.1	43.9	43.6	43.87	0.25
L-L	80	81	80	80.33	0.58
AvRM-AvRM	48	47.7	47.3	47.67	0.35
IF-IF	49.7	48.2	49.3	49.07	0.78
CRA-CRA	28.4	29.5	30.9	29.60	1.25
GPF-GPF	28.6	29	28.7	28.77	0.21
MRA-MRA	32.2	31.1	31.3	31.53	0.59
CR-CR	25.1	24.8	25.3	25.07	0.25
MF-MF	45.8	46.1	45.8	45.90	0.17
L-L	82.3	82.9	83.2	82.80	0.46
AvRM-AvRM	56.3	55.1	54.9	55.43	0.76
IF-IF	43.8	44.8	44.5	44.37	0.51
CRA-CRA	24.1	24.8	24.6	24.50	0.36
GPF-GPF	26.7	26	26.9	26.53	0.47
MRA-MRA	28.8	27.6	28.3	28.23	0.60
CR-CR	20.9	20.9	20.6	20.80	0.17
MF-MF	44.3	44.1	43.6	44.00	0.36
L-L	73.5	71.4	71.6	72.17	1.16
AvRM-AvRM	48.1	48.1	48.7	48.30	0.35
IF-IF	53.5	52.9	53.6	53.33	0.38
CRA-CRA	36.8	36.7	36.8	36.77	0.06
GPF-GPF	31.2	30.5	31	30.90	0.36
MRA-MRA	42.6	42.3	41.8	42.23	0.40
CR-CR	16.3	17.7	16.8	16.93	0.71
MF-MF	44.3	44.5	47.6	45.47	1.85
L-L	84.1	84.2	83.6	83.97	0.32
AvRM-AvRM	53.5	53.6	53.8	53.63	0.15
IF-IF	56.9	57.6	56.9	57.13	0.40

CRA-CRA	31.2	30.9	31.2	31.10	0.17
GPF-GPF	31.2	31	31.4	31.20	0.20
MRA-MRA	36.2	36.9	35.9	36.33	0.51
CR-CR	23.2	22.8	23.5	23.17	0.35
MF-MF	48.3	48.6	48.3	48.40	0.17
L-L	85.6	86	84	85.20	1.06
AvRM-AvRM	52.2	51.5	51	51.57	0.60
IF-IF	45.9	44.6	44.8	45.10	0.70
CRA-CRA	26.5	25.7	25.8	26.00	0.44
GPF-GPF	25.5	26	25.8	25.77	0.25
MRA-MRA	32.2	32.3	31.6	32.03	0.38
CR-CR	19.8	19.6	19.1	19.50	0.36
MF-MF	43.5	42.8	42.6	42.97	0.47
L-L	70	70.3	70	70.10	0.17
AvRM-AvRM	50.7	50.6	51.3	50.87	0.38
IF-IF	52.2	52.2	52.2	52.20	0.00
CRA-CRA	28.1	28.3	28	28.13	0.15
GPF-GPF	30.7	30.4	30.4	30.50	0.17
MRA-MRA	34.5	35.9	35.8	35.40	0.78
CR-CR	22	22	21.5	21.83	0.29
MF-MF	46.7	46.1	46.7	46.50	0.35
L-L	80.7	78.7	81	80.13	1.25
AvRM-AvRM	53.9	53.7	54	53.87	0.15
IF-IF	49.5	48.6	48.6	48.90	0.52
CRA-CRA	30.7	31.6	30.7	31.00	0.52
GPF-GPF	29.9	29	29.2	29.37	0.47
MRA-MRA	31.3	31.8	31.8	31.63	0.29
CR-CR	25.8	25.6	25.3	25.57	0.25
MF-MF	48.6	49.7	49.1	49.13	0.55
L-L	82.9	82.3	81.8	82.33	0.55
AvRM-AvRM	52.5	53.8	54.2	53.50	0.89
IF-IF	49.4	49.1	49.5	49.33	0.21
CRA-CRA	28.4	28.7	29	28.70	0.30
GPF-GPF	29.6	29.4	29.2	29.40	0.20
MRA-MRA	34.5	34.3	33.9	34.23	0.31
CR-CR	22.5	22	23.3	22.60	0.66

MF-MF	44.8	44.6	45	44.80	0.20
L-L	77.3	77.5	76.9	77.23	0.31
AvRM-AvRM	53.9	53.6	53.2	53.57	0.35
IF-IF	50.3	50.8	50.5	50.53	0.25
CRA-CRA	30	30.3	30.3	30.20	0.17
GPF-GPF	31	31.5	31.3	31.27	0.25
MRA-MRA	31.3	31.8	32.2	31.77	0.45
CR-CR	23	22.8	22.7	22.83	0.15
MF-MF	41.7	42.2	42	41.97	0.25
L-L	82.9	83.5	82.9	83.10	0.35
AvRM-AvRM	54.3	54	54.3	54.20	0.17
IF-IF	50.6	51.9	51.8	51.43	0.72
CRA-CRA	28.8	28.8	29	28.87	0.12
GPF-GPF	32.5	31.5	31.9	31.97	0.50
MRA-MRA	41.5	42.4	41.5	41.80	0.52
CR-CR	19.7	20.6	21.3	20.53	0.80
MF-MF	48.2	48.2	47.8	48.07	0.23
L-L	82.3	80.9	81.9	81.70	0.72
AvRM-AvRM	52.3	52.5	51.8	52.20	0.36
IF-IF	42.9	43	43.5	43.13	0.32
CRA-CRA	28.6	28	28	28.20	0.35
GPF-GPF	30.3	30.1	30.3	30.23	0.12
MRA-MRA	38.4	38.7	38.9	38.67	0.25
CR-CR	21.8	20.9	21.8	21.50	0.52
MF-MF	45.2	44.9	44.7	44.93	0.25
L-L	77.2	76.5	76.7	76.80	0.36
AvRM-AvRM	52.2	52.1	51.7	52.00	0.26
IF-IF	56.6	56.8	57.3	56.90	0.36
CRA-CRA	37.1	35.6	35.9	36.20	0.79
GPF-GPF	32.3	31.5	31.8	31.87	0.40
MRA-MRA	38.7	38.9	38.3	38.63	0.31
CR-CR	22	21.8	20.6	21.47	0.76
MF-MF	49.2	48.5	49.4	49.03	0.47
L-L	86.3	86	86	86.10	0.17
AvRM-AvRM	51.8	52.5	52.4	52.23	0.38

IF-IF	51.6	50.2	52.2	51.33	1.03
CRA-CRA	27.5	28.7	27.7	27.97	0.64
GPF-GPF	26.7	26.1	25.7	26.17	0.50
MRA-MRA	30.1	30.1	30.3	30.17	0.12
CR-CR	21.1	22.1	21.9	21.70	0.53
MF-MF	44.6	44.4	44.8	44.60	0.20
L-L	79.1	78.5	78.7	78.77	0.31
AvRM-AvRM	55.7	55.2	55.4	55.43	0.25
IF-IF	46.5	47.4	47.8	47.23	0.67
CRA-CRA	26.1	24.7	24.9	25.23	0.76
GPF-GPF	25.9	25.3	25.1	25.43	0.42
MRA-MRA	28.9	29.3	28.6	28.93	0.35
CR-CR	22	22.2	21.2	21.80	0.53
MF-MF	42.2	42.7	42.7	42.53	0.29
L-L	75.8	74.8	74.6	75.07	0.64
AvRM-AvRM	51.4	51.4	51.8	51.53	0.23
IF-IF	47.6	48	48.3	47.97	0.35
CRA-CRA	29	28.8	29.5	29.10	0.36
GPF-GPF	27.6	27.4	27.6	27.53	0.12
MRA-MRA	31.6	31.1	31.3	31.33	0.25
CR-CR	17.5	19.5	18.7	18.57	1.01
MF-MF	44.9	44.9	44.7	44.83	0.12
L-L	84.1	84.3	84.6	84.33	0.25
AvRM-AvRM	52.7	52.8	53.2	52.90	0.26
IF-IF	53.2	53.2	53.6	53.33	0.23
CRA-CRA	31	30.8	31.6	31.13	0.42
GPF-GPF	26.8	28.3	28.1	27.73	0.81
MRA-MRA	29.2	29.7	29.9	29.60	0.36
CR-CR	19.1	19.4	18.6	19.03	0.40
MF-MF	41	41.1	40.8	40.97	0.15
L-L	81.4	81.7	81.6	81.57	0.15
AvRM-AvRM	45.1	45.1	44.9	45.03	0.12
IF-IF	42.6	42.6	42.6	42.60	0.00
CRA-CRA	27.9	27.2	27.3	27.47	0.38
GPF-GPF	26.8	26.1	25.9	26.27	0.47

MRA-MRA	32.3	31.9	32.8	32.33	0.45
CR-CR	22	22.9	23.1	22.67	0.59
MF-MF	42.4	42.9	42.6	42.63	0.25
L-L	78.4	77.8	78	78.07	0.31
AvRM-AvRM	50.1	49.2	49.2	49.50	0.52
IF-IF	60.2	58.5	59.3	59.33	0.85
CRA-CRA	28.7	28.4	29.6	28.90	0.62
GPF-GPF	32.8	33.1	32.8	32.90	0.17
MRA-MRA	32.8	34.4	34.2	33.80	0.87
CR-CR	15.6	15.9	15.9	15.80	0.17
MF-MF	50.6	51	50.6	50.73	0.23
L-L	90.6	90.8	90.6	90.67	0.12
AvRM-AvRM	52.1	52.1	52.7	52.30	0.35
IF-IF	50.3	51.6	50.8	50.90	0.66
CRA-CRA	28	28.3	28.3	28.20	0.17
GPF-GPF	32.1	32.4	32.4	32.30	0.17
MRA-MRA	33.3	33.5	33.5	33.43	0.12
CR-CR	22.9	23.5	22.2	22.87	0.65
MF-MF	40.6	40.6	40.9	40.70	0.17
L-L	82.1	82.1	81.7	81.97	0.23
AvRM-AvRM	49.9	49.7	49.9	49.83	0.12
IF-IF	54.5	54.9	54.2	54.53	0.35
CRA-CRA	31.5	31.6	31.7	31.60	0.10
GPF-GPF	33.3	32.8	33.5	33.20	0.36
MRA-MRA	44.3	44.5	43.8	44.20	0.36
CR-CR	18.7	18.6	19.1	18.80	0.26
MF-MF	52.1	52.1	52.3	52.17	0.12
L-L	87.5	86.9	88.1	87.50	0.60
AvRM-AvRM	53.4	53.6	53.4	53.47	0.12
IF-IF	44.8	46.5	45.9	45.73	0.86
CRA-CRA	20.7	21.2	21.6	21.17	0.45
GPF-GPF	25.5	25.5	25.7	25.57	0.12
MRA-MRA	30.3	29.7	29.9	29.97	0.31
CR-CR	13.7	14.4	13.9	14.00	0.36
MF-MF	44.4	43.9	44.6	44.30	0.36
L-L	75.3	75.6	75.3	75.40	0.17

AvRM-AvRM	50.4	51.9	51.6	51.30	0.79
IF-IF	41.3	40.5	41.5	41.10	0.53
CRA-CRA	30.8	30.4	29.6	30.27	0.61
GPF-GPF	22.2	22.4	22.6	22.40	0.20
MRA-MRA	30	30.4	29.6	30.00	0.40
CR-CR	19.5	19.7	19.1	19.43	0.31
MF-MF	40.5	40.7	41.1	40.77	0.31
L-L	68.6	68.2	68.6	68.47	0.23
AvRM-AvRM	51.8	50.8	51.4	51.33	0.50
IF-IF	48.8	48.9	49.2	48.97	0.21
CRA-CRA	28.4	28.1	29.3	28.60	0.62
GPF-GPF	30	30.5	30	30.17	0.29
MRA-MRA	31	31.9	31.2	31.37	0.47
CR-CR	22.3	21.6	23.7	22.53	1.07
MF-MF	49.3	48.8	49.5	49.20	0.36
L-L	80.5	79.5	79.8	79.93	0.51
AvRM-AvRM	52.6	52.8	52.8	52.73	0.12
IF-IF	54	53.6	52.6	53.40	0.72
CRA-CRA	28.9	28.6	29	28.83	0.21
GPF-GPF	30.6	31.5	31.4	31.17	0.49
MRA-MRA	36	35.4	36.2	35.87	0.42
CR-CR	24.7	25.5	25.1	25.10	0.40
MF-MF	43.4	43.2	42.8	43.13	0.31
L-L	84.3	84.3	85.3	84.63	0.58
AvRM-AvRM	47.7	47.7	47.4	47.60	0.17
IF-IF	49.6	49.8	49.8	49.73	0.12
CRA-CRA	25.6	24.5	25.1	25.07	0.55
GPF-GPF	29.2	29.5	29.1	29.27	0.21
MRA-MRA	25.5	25.5	25.4	25.47	0.06
CR-CR	18.2	17.9	18.1	18.07	0.15
MF-MF	43.1	42.5	42.6	42.73	0.32
L-L	77.5	77.3	77.3	77.37	0.12
AvRM-AvRM	50.8	50.6	50.8	50.73	0.12
IF-IF	38.4	39.3	38.4	38.70	0.52

CRA-CRA	26.2	26.4	27.3	26.63	0.59
GPF-GPF	23.2	23.2	23.4	23.27	0.12
MRA-MRA	26	26.2	26.7	26.30	0.36
CR-CR	21.8	21.7	22.4	21.97	0.38
MF-MF	43.2	42.1	42.6	42.63	0.55
L-L	77.1	78.1	78.2	77.80	0.61
AvRM-AvRM	54.2	53	53.6	53.60	0.60
IF-IF	47.7	48.9	47.7	48.10	0.69
CRA-CRA	26.7	26.3	26.3	26.43	0.23
GPF-GPF	26.5	26.1	26.5	26.37	0.23
MRA-MRA	37	37	37.2	37.07	0.12
CR-CR	23.6	24	23.4	23.67	0.31
MF-MF	43.4	43.4	42.8	43.20	0.35
L-L	82.2	82.3	81.6	82.03	0.38
AvRM-AvRM	49.4	49.4	49.4	49.40	0.00
IF-IF	50.7	50.3	51.1	50.70	0.40
CRA-CRA	29.2	29.6	29.4	29.40	0.20
GPF-GPF	32.2	32.4	32.5	32.37	0.15
MRA-MRA	36.1	35.6	36.7	36.13	0.55
CR-CR	19.6	20.1	19.3	19.67	0.40
MF-MF	39.9	40.4	39.5	39.93	0.45
L-L	81.2	81.5	81	81.23	0.25
AvRM-AvRM	53.8	52.8	52.1	52.90	0.85
IF-IF	46.2	46.8	46.6	46.53	0.31
CRA-CRA	26	26	25.4	25.80	0.35
GPF-GPF	28.7	28.9	28.9	28.83	0.12
MRA-MRA	31.7	32.4	32.6	32.23	0.47
CR-CR	20.1	20.8	19.4	20.10	0.70
MF-MF	48.8	48.4	48.8	48.67	0.23
L-L	78.5	78.7	78.1	78.43	0.31
AvRM-AvRM	52.3	52.8	52.3	52.47	0.29
IF-IF	48.7	48.4	49	48.70	0.30
CRA-CRA	29.1	28.8	29.2	29.03	0.21
GPF-GPF	29.7	29.2	29.2	29.37	0.29
MRA-MRA	36	35.7	36.4	36.03	0.35
CR-CR	23.2	22.9	23.6	23.23	0.35

MF-MF	50.4	50.1	50.9	50.47	0.40
L-L	83.5	83.5	83.5	83.50	0.00
AvRM-AvRM	55.4	55.4	55.4	55.40	0.00
IF-IF	53.6	53.8	53.8	53.73	0.12
CRA-CRA	28.2	28.6	28.4	28.40	0.20
GPF-GPF	33	33.2	33.2	33.13	0.12
MRA-MRA	38.4	39	39	38.80	0.35
CR-CR	20.2	20.6	20.4	20.40	0.20
MF-MF	48.4	48.1	48.1	48.20	0.17
L-L	82.5	82.5	82.5	82.50	0.00
AvRM-AvRM	52.4	53	52.7	52.70	0.30
IF-IF	50.7	50.3	51.3	50.77	0.50
CRA-CRA	25.2	24.8	25.3	25.10	0.26
GPF-GPF	29.5	30.2	29.1	29.60	0.56
MRA-MRA	30.7	31.1	30.7	30.83	0.23
CR-CR	18.8	18.8	18.4	18.67	0.23
MF-MF	43.9	44.8	45.7	44.80	0.90
L-L	75.6	76.5	76.5	76.20	0.52
AvRM-AvRM	50.5	51	50.4	50.63	0.32
IF-IF	58.3	58.3	58.3	58.30	0.00
CRA-CRA	32.2	32.2	31.9	32.10	0.17
GPF-GPF	27.8	27.8	27.8	27.80	0.00
MRA-MRA	35.5	35.2	35.5	35.40	0.17
CR-CR	18.2	18.4	19.1	18.57	0.47
MF-MF	46.8	46.8	46.1	46.57	0.40
L-L	84.1	83.8	83.8	83.90	0.17
AvRM-AvRM	60.3	59.8	59.4	59.83	0.45
IF-IF	53	53.3	53.2	53.17	0.15
CRA-CRA	29.2	30.2	29.9	29.77	0.51
GPF-GPF	31.6	31.9	32.1	31.87	0.25
MRA-MRA	34.9	34.9	34.6	34.80	0.17
CR-CR	22.6	22.7	22.1	22.47	0.32
MF-MF	50.3	50.8	50.3	50.47	0.29
L-L	88.5	88.2	89.3	88.67	0.57
AvRM-AvRM	52.6	52.8	52.6	52.67	0.12

IF-IF	58.8	58.2	57.9	58.30	0.46
CRA-CRA	32.2	32.4	32.2	32.27	0.12
GPF-GPF	28.6	28.8	28.8	28.73	0.12
MRA-MRA	32.4	32.5	31.9	32.27	0.32
CR-CR	16	16.5	16.3	16.27	0.25
MF-MF	47	47.3	47	47.10	0.17
L-L	82.4	82.1	82.1	82.20	0.17
AvRM-AvRM	52.2	51.8	51.5	51.83	0.35
IF-IF	50	50.5	50.8	50.43	0.40
CRA-CRA	28.6	28.1	27.5	28.07	0.55
GPF-GPF	31.3	30.8	30.8	30.97	0.29
MRA-MRA	35.7	36	36	35.90	0.17
CR-CR	18.4	17.6	18.7	18.23	0.57
MF-MF	41.2	41.7	40.9	41.27	0.40
L-L	81.6	82.4	81.6	81.87	0.46
AvRM-AvRM	51.1	51.6	51.9	51.53	0.40
IF-IF	51.3	51.3	51.3	51.30	0.00
CRA-CRA	31.1	31.5	31.1	31.23	0.23
GPF-GPF	28.9	29.3	28.6	28.93	0.35
MRA-MRA	32.2	32.6	32.2	32.33	0.23
CR-CR	14.3	15.1	14.6	14.67	0.40
MF-MF	45.4	45.5	45.8	45.57	0.21
L-L	79.4	79.5	80	79.63	0.32
AvRM-AvRM	46.7	46.4	46.7	46.60	0.17
IF-IF	50.2	49.4	49.8	49.80	0.40
CRA-CRA	25.9	25.1	24.7	25.23	0.61
GPF-GPF	32.3	32.3	32.7	32.43	0.23
MRA-MRA	32.4	31.1	31.4	31.63	0.68
CR-CR	19.7	19.7	19.7	19.70	0.00
MF-MF	46.7	45.7	46	46.13	0.51
L-L	80.6	80.1	80.8	80.50	0.36
AvRM-AvRM	48.9	49.2	49.2	49.10	0.17
IF-IF	55.6	55.2	55.6	55.47	0.23
CRA-CRA	20.3	20.3	20.9	20.50	0.35
GPF-GPF	27.1	26.8	26.6	26.83	0.25

MRA-MRA	32.5	32.3	31.5	32.10	0.53
CR-CR	18.1	18.1	18.4	18.20	0.17
MF-MF	50.3	50.5	49.5	50.10	0.53
L-L	77.3	77.5	78	77.60	0.36
AvRM-AvRM	52.5	52.6	52.2	52.43	0.21
IF-IF	50.7	51.1	51.1	50.97	0.23
CRA-CRA	32.9	33.5	32	32.80	0.75
GPF-GPF	29.4	29.4	29.7	29.50	0.17
MRA-MRA	39.5	39.1	39.1	39.23	0.23
CR-CR	23.6	22.5	23.2	23.10	0.56
MF-MF	48.6	48.9	48.2	48.57	0.35
L-L	92.4	92	92.2	92.20	0.20
AvRM-AvRM	56.6	56.6	56.9	56.70	0.17
IF-IF	43.4	42.9	42.6	42.97	0.40
CRA-CRA	25.8	23.9	23.9	24.53	1.10
GPF-GPF	30.2	31	31	30.73	0.46
MRA-MRA	32.1	31.6	32.1	31.93	0.29
CR-CR	16.5	17	17.4	16.97	0.45
MF-MF	42	42.7	42.5	42.40	0.36
L-L	84.6	83.8	83.5	83.97	0.57
AvRM-AvRM	50.8	50.3	50	50.37	0.40
IF-IF	51.1	50.8	50.8	50.90	0.17
CRA-CRA	26.3	26.3	26.9	26.50	0.35
GPF-GPF	30.3	31	30.6	30.63	0.35
MRA-MRA	32.5	33.7	32.7	32.97	0.64
CR-CR	19.4	19.6	19.1	19.37	0.25
MF-MF	46.6	46.2	46.4	46.40	0.20
L-L	86.4	87.1	87.1	86.87	0.40
AvRM-AvRM	53.3	53.5	54.2	53.67	0.47
IF-IF	58.6	57.7	57.5	57.93	0.59
CRA-CRA	27.9	28.7	27	27.87	0.85
GPF-GPF	33.6	33.9	33	33.50	0.46
MRA-MRA	37.7	37.1	37.4	37.40	0.30
CR-CR	18.3	18.6	18.9	18.60	0.30
MF-MF	41.8	41.3	41.8	41.63	0.29
L-L	82.3	80.7	81.7	81.57	0.81

AvRM-AvRM	50.4	50.6	50.4	50.47	0.12
IF-IF	50.8	51.1	50.8	50.90	0.17
CRA-CRA	28.5	28.2	28.5	28.40	0.17
GPF-GPF	27.5	28.1	27.8	27.80	0.30
MRA-MRA	33.5	34.1	33.5	33.70	0.35
CR-CR	23.8	23.2	23.1	23.37	0.38
MF-MF	44.7	45	44.7	44.80	0.17
L-L	81.2	80.9	81.9	81.33	0.51
AvRM-AvRM	52.3	51.6	52.1	52.00	0.36
IF-IF	46.7	45.9	46.4	46.33	0.40
CRA-CRA	29.5	30.3	31.1	30.30	0.80
GPF-GPF	25.8	26	25.8	25.87	0.12
MRA-MRA	30.7	29.8	30.5	30.33	0.47
CR-CR	22.4	22.9	22.8	22.70	0.26
MF-MF	41.5	40.5	42.3	41.43	0.90
L-L	83.5	84.2	83.7	83.80	0.36
AvRM-AvRM	48.9	48.9	49.1	48.97	0.12
IF-IF	52.7	52.2	52.2	52.37	0.29
CRA-CRA	30.2	30.5	30.5	30.40	0.17
GPF-GPF	31.9	32.6	32.4	32.30	0.36
MRA-MRA	30.1	31	30.8	30.63	0.47
CR-CR	18.1	17.8	18.3	18.07	0.25
MF-MF	44.7	43.6	45.2	44.50	0.82
L-L	88.4	88.2	87.3	87.97	0.59
AvRM-AvRM	52.3	52.5	52.7	52.50	0.20
IF-IF	47.4	47.1	46.9	47.13	0.25
CRA-CRA	23.8	23.7	23.8	23.77	0.06
GPF-GPF	30	30.5	30.2	30.23	0.25
MRA-MRA	33.1	32.3	33.3	32.90	0.53
CR-CR	26.1	25.6	26.1	25.93	0.29
MF-MF	43.2	42.3	43.6	43.03	0.67
L-L	83.4	83.8	83.2	83.47	0.31
AvRM-AvRM	53.6	53.4	53.4	53.47	0.12
IF-IF	61.8	61.1	61.4	61.43	0.35

CRA-CRA	32.3	32.6	32.3	32.40	0.17
GPF-GPF	34	34	34.4	34.13	0.23
MRA-MRA	40.3	40	40	40.10	0.17
CR-CR	20.8	20.8	20.8	20.80	0.00
MF-MF	50.3	50.1	50.3	50.23	0.12
L-L	81.9	82.2	81.9	82.00	0.17
AvRM-AvRM	57.3	57.1	58	57.47	0.47
IF-IF	41.5	41.3	41.3	41.37	0.12
CRA-CRA	21.9	21.9	21.8	21.87	0.06
GPF-GPF	25.3	25.7	25.5	25.50	0.20
MRA-MRA	31.5	32.2	32.3	32.00	0.44
CR-CR	18.5	17.8	18.5	18.27	0.40
MF-MF	42.9	43.4	42.7	43.00	0.36
L-L	81.2	82.6	82.8	82.20	0.87
AvRM-AvRM	49.2	49.4	49.2	49.27	0.12
IF-IF	46.4	46.4	46.1	46.30	0.17
CRA-CRA	27.4	27.4	27.4	27.40	0.00
GPF-GPF	28.2	28.6	28.5	28.43	0.21
MRA-MRA	34.9	33.5	34.3	34.23	0.70
CR-CR	17	17.1	17	17.03	0.06
MF-MF	42.6	42.4	41.8	42.27	0.42
L-L	74.5	74.8	74.3	74.53	0.25
AvRM-AvRM	50.2	50.5	50	50.23	0.25
IF-IF	44.9	44.4	44.9	44.73	0.29
CRA-CRA	29.2	29.7	29.2	29.37	0.29
GPF-GPF	30.7	30.3	30.7	30.57	0.23
MRA-MRA	35.8	36.2	36	36.00	0.20
CR-CR	21.9	21.4	21.2	21.50	0.36
MF-MF	43	42.6	42.6	42.73	0.23
L-L	81.3	83.1	84.1	82.83	1.42
AvRM-AvRM	53.4	54.7	53.7	53.93	0.68
IF-IF	50.1	48.7	49.1	49.30	0.72
CRA-CRA	33.1	32.4	32.4	32.63	0.40
GPF-GPF	28	28.5	28.2	28.23	0.25
MRA-MRA	37.1	37.4	37.1	37.20	0.17
CR-CR	17.4	17.1	17.4	17.30	0.17

MF-MF	44.2	44.9	45.3	44.80	0.56
L-L	81.3	81.5	81.7	81.50	0.20
AvRM-AvRM	52.7	52	52.4	52.37	0.35
IF-IF	49.8	49.1	50.1	49.67	0.51
CRA-CRA	29.1	30.5	30.3	29.97	0.76
GPF-GPF	29.2	29.2	28.8	29.07	0.23
MRA-MRA	31.6	31.6	31.4	31.53	0.12
CR-CR	19.1	19.1	18.9	19.03	0.12
MF-MF	46.4	46.4	45.9	46.23	0.29
L-L	82.2	82.6	82.8	82.53	0.31
AvRM-AvRM	55.2	54.9	54.5	54.87	0.35
IF-IF	51.5	52.3	51.2	51.67	0.57
CRA-CRA	33.7	33.4	31.4	32.83	1.25
GPF-GPF	28.5	28.6	28.3	28.47	0.15
MRA-MRA	30.4	31.5	30.6	30.83	0.59
CR-CR	21	21	21.6	21.20	0.35
MF-MF	46.5	46.5	46.7	46.57	0.12
L-L	77.9	77.4	77.9	77.73	0.29
AvRM-AvRM	54.8	54.8	55.1	54.90	0.17
IF-IF	50.3	51.8	49.6	50.57	1.12
CRA-CRA	29.8	29.6	29.3	29.57	0.25
GPF-GPF	29.4	29.3	29.8	29.50	0.26
MRA-MRA	33.8	33.6	33.8	33.73	0.12
CR-CR	20.3	20.5	21.8	20.87	0.81
MF-MF	47.8	48	48	47.93	0.12
L-L	79.4	79.2	79.4	79.33	0.12
AvRM-AvRM	54.3	54.2	54.2	54.23	0.06
IF-IF	51.3	50.9	51.2	51.13	0.21
CRA-CRA	33.7	32.7	32	32.80	0.85
GPF-GPF	29.7	30.8	30.1	30.20	0.56
MRA-MRA	38.4	38.8	38	38.40	0.40
CR-CR	22.8	23.6	22.5	22.97	0.57
MF-MF	49	49.8	49.4	49.40	0.40
L-L	82.4	82.7	83.6	82.90	0.62
AvRM-AvRM	59.9	59.6	59.6	59.70	0.17

IF-IF	48.7	49.4	49.6	49.23	0.47
CRA-CRA	28.8	29.6	28.3	28.90	0.66
GPF-GPF	28.8	29.8	29.4	29.33	0.50
MRA-MRA	35	35.2	34.8	35.00	0.20
CR-CR	19.9	21.4	20.3	20.53	0.78
MF-MF	44.8	44.8	44.4	44.67	0.23
L-L	77.7	77.3	78	77.67	0.35
AvRM-AvRM	52.1	52.1	52.6	52.27	0.29
IF-IF	47.7	47.2	47.7	47.53	0.29
CRA-CRA	33.3	34.6	33.6	33.83	0.68
GPF-GPF	30.5	30.3	30.4	30.40	0.10
MRA-MRA	38.4	38.7	38.6	38.57	0.15
CR-CR	18.6	19.6	18.9	19.03	0.51
MF-MF	45.4	44.7	44	44.70	0.70
L-L	79.3	79.4	79.6	79.43	0.15
AvRM-AvRM	50.5	50.5	51.1	50.70	0.35
IF-IF	48	48.5	48.2	48.23	0.25
CRA-CRA	30.1	29.5	29.5	29.70	0.35
GPF-GPF	29.5	29.5	29.3	29.43	0.12
MRA-MRA	39.4	39.6	38.9	39.30	0.36
CR-CR	19.2	20.4	19.9	19.83	0.60
MF-MF	41.8	41.2	41.1	41.37	0.38
L-L	87	87.8	87.1	87.30	0.44
AvRM-AvRM	48.9	48.7	48.7	48.77	0.12
IF-IF	46.2	46.4	45.6	46.07	0.42
CRA-CRA	31.7	30.5	29.9	30.70	0.92
GPF-GPF	27	27.5	27	27.17	0.29
MRA-MRA	32.8	32.8	33.3	32.97	0.29
CR-CR	16.5	17.1	17.4	17.00	0.46
MF-MF	41.5	41.7	41.2	41.47	0.25
L-L	75.8	75.8	76	75.87	0.12
AvRM-AvRM	52.4	52.4	52.4	52.40	0.00
IF-IF	47	47.7	47.7	47.47	0.40
CRA-CRA	28.9	28.7	28.9	28.83	0.12
GPF-GPF	29	28.6	28.6	28.73	0.23

MRA-MRA	35.8	35.7	35.5	35.67	0.15
CR-CR	18	16.8	17.1	17.30	0.62
MF-MF	44	44.5	43.8	44.10	0.36
L-L	77.4	78.4	78.1	77.97	0.51
AvRM-AvRM	47.6	47.4	47.4	47.47	0.12
IF-IF	60.6	61.1	60.6	60.77	0.29
CRA-CRA	33.3	33.5	33.7	33.50	0.20
GPF-GPF	33.7	33.2	33.4	33.43	0.25
MRA-MRA	32.9	32.6	32.8	32.77	0.15
CR-CR	15.9	15.5	15.2	15.53	0.35
MF-MF	47.5	47.7	47.3	47.50	0.20
L-L	82.1	83	82.5	82.53	0.45
AvRM-AvRM	48.4	48.2	48.6	48.40	0.20
IF-IF	46.8	47.2	47.3	47.10	0.26
CRA-CRA	25.8	25.4	25	25.40	0.40
GPF-GPF	31.8	31.2	32.3	31.77	0.55
MRA-MRA	30.2	30.2	30	30.13	0.12
CR-CR	20.4	20.9	20.6	20.63	0.25
MF-MF	48.5	48	47.5	48.00	0.50
L-L	82	81.7	81.4	81.70	0.30
AvRM-AvRM	54.4	54.4	54.6	54.47	0.12
IF-IF	45.7	46.5	46	46.07	0.40
CRA-CRA	23.1	23.6	23.1	23.27	0.29
GPF-GPF	27	27	26.8	26.93	0.12
MRA-MRA	29.5	30.1	29.7	29.77	0.31
CR-CR	19.5	19.5	19.2	19.40	0.17
MF-MF	43.8	44.7	44.8	44.43	0.55
L-L	75	75.3	75.6	75.30	0.30
AvRM-AvRM	51	50.9	50.7	50.87	0.15
IF-IF	48	48.2	47.8	48.00	0.20
CRA-CRA	33.5	32.6	33.6	33.23	0.55
GPF-GPF	29.4	28.6	29	29.00	0.40
MRA-MRA	33.8	34.6	33.6	34.00	0.53
CR-CR	17.9	17.5	18.3	17.90	0.40
MF-MF	41.3	42.4	41.5	41.73	0.59
L-L	77.8	78.2	78.2	78.07	0.23

AvRM-AvRM	47.3	47.6	47.6	47.50	0.17
IF-IF	51.4	51.4	51.6	51.47	0.12
CRA-CRA	23.4	24.9	23.7	24.00	0.79
GPF-GPF	28.6	28.6	28.4	28.53	0.12
MRA-MRA	34.4	34.2	34.3	34.30	0.10
CR-CR	18.7	20	19.8	19.50	0.70
MF-MF	45.1	45.3	45	45.13	0.15
L-L	80.9	81.5	81.5	81.30	0.35
AvRM-AvRM	55.4	55.2	54.6	55.07	0.42
IF-IF	50.6	50.1	50.4	50.37	0.25
CRA-CRA	26	25	24.8	25.27	0.64
GPF-GPF	28.7	28.2	29.2	28.70	0.50
MRA-MRA	31.7	31.2	31.4	31.43	0.25
CR-CR	16.9	17.7	18.2	17.60	0.66
MF-MF	41.2	41.7	42	41.63	0.40
L-L	78.2	78.4	77.6	78.07	0.42
AvRM-AvRM	51.1	51.3	51.7	51.37	0.31
IF-IF	45.7	46.6	45.3	45.87	0.67
CRA-CRA	23.3	23.9	23	23.40	0.46
GPF-GPF	26.7	26.5	26.7	26.63	0.12
MRA-MRA	31.9	31.4	31.6	31.63	0.25
CR-CR	19.4	19.7	19.5	19.53	0.15
MF-MF	47.8	48.3	48	48.03	0.25
L-L	80.4	79	79.3	79.57	0.74
AvRM-AvRM	52.1	52.1	52.3	52.17	0.12
IF-IF	46.8	45.3	45.9	46.00	0.75
CRA-CRA	24.6	24.8	25	24.80	0.20
GPF-GPF	30.5	30.3	30.3	30.37	0.12
MRA-MRA	35.1	35.7	35.5	35.43	0.31
CR-CR	18.9	19.5	19.2	19.20	0.30
MF-MF	42.9	43	42.7	42.87	0.15
L-L	77.6	78	77.8	77.80	0.20
AvRM-AvRM	49.8	49.8	50	49.87	0.12
IF-IF	54.8	54.2	55.1	54.70	0.46

CRA-CRA	27.3	28.3	28.5	28.03	0.64
GPF-GPF	31.2	30.8	30.3	30.77	0.45
MRA-MRA	39.9	40.9	40.5	40.43	0.50
CR-CR	17.7	18.5	18	18.07	0.40
MF-MF	48.1	48.5	48.7	48.43	0.31
L-L	79.3	79.3	79.1	79.23	0.12
AvRM-AvRM	58.5	58.8	59	58.77	0.25
IF-IF	50.5	50.7	50.7	50.63	0.12
CRA-CRA	29.8	29.1	29.4	29.43	0.35
GPF-GPF	30.8	30.8	31.7	31.10	0.52
MRA-MRA	32.9	32.3	32.6	32.60	0.30
CR-CR	19.7	20.2	19.6	19.83	0.32
MF-MF	43.9	43.4	43.9	43.73	0.29
L-L	79.2	79.6	81.3	80.03	1.12
AvRM-AvRM	52.1	52.1	51.5	51.90	0.35
IF-IF	46.6	47.7	47.3	47.20	0.56
CRA-CRA	28.7	29.1	29.5	29.10	0.40
GPF-GPF	26.7	27.3	27.2	27.07	0.32
MRA-MRA	28.2	28.4	28.4	28.33	0.12
CR-CR	21.2	21.4	22.1	21.57	0.47
MF-MF	42.6	41.3	41.5	41.80	0.70
L-L	79.7	79.5	79.1	79.43	0.31
AvRM-AvRM	46.1	45.8	45.3	45.73	0.40
IF-IF	53.6	53.6	53.8	53.67	0.12
CRA-CRA	28.3	28	27.8	28.03	0.25
GPF-GPF	30.3	30.4	30.3	30.33	0.06
MRA-MRA	34.3	33.2	33	33.50	0.70
CR-CR	19.2	19.7	19.7	19.53	0.29
MF-MF	37.4	37.4	37.3	37.37	0.06
L-L	81.7	81.5	80.7	81.30	0.53
AvRM-AvRM	51	51	51.2	51.07	0.12
IF-IF	56.7	57.4	57.8	57.30	0.56
CRA-CRA	32.2	31.3	32.1	31.87	0.49
GPF-GPF	33.3	33.1	33.9	33.43	0.42
MRA-MRA	38.2	38.3	38.4	38.30	0.10
CR-CR	22	22.9	21.5	22.13	0.71

MF-MF	48.6	49.3	49.1	49.00	0.36
L-L	84.3	84.6	84.9	84.60	0.30
AvRM-AvRM	57.4	57.7	58	57.70	0.30
IF-IF	44.4	44.1	44.4	44.30	0.17
CRA-CRA	24.8	25.5	25.4	25.23	0.38
GPF-GPF	27.8	27.2	28.1	27.70	0.46
MRA-MRA	28.4	28.4	28.1	28.30	0.17
CR-CR	17.4	17.4	16.6	17.13	0.46
MF-MF	46.4	46.2	46.4	46.33	0.12
L-L	75.3	76.2	75.7	75.73	0.45
AvRM-AvRM	54.2	54.6	55.6	54.80	0.72
IF-IF	49	49	48.7	48.90	0.17
CRA-CRA	26	25.1	25.7	25.60	0.46
GPF-GPF	30.5	30.3	29.7	30.17	0.42
MRA-MRA	30.8	30.8	30.6	30.73	0.12
CR-CR	20.3	21	21.3	20.87	0.51
MF-MF	43.8	44.7	43.8	44.10	0.52
L-L	83	82.1	83.3	82.80	0.62
AvRM-AvRM	52	52.6	51.9	52.17	0.38
IF-IF	45.2	45.6	45	45.27	0.31
CRA-CRA	24.9	24.2	24.4	24.50	0.36
GPF-GPF	27.4	27.9	27.6	27.63	0.25
MRA-MRA	30.7	29.9	29.8	30.13	0.49
CR-CR	18.9	19.2	19.2	19.10	0.17
MF-MF	41.1	41.9	41.3	41.43	0.42
L-L	75.5	75.8	76.1	75.80	0.30
AvRM-AvRM	46.8	47.6	47.4	47.27	0.42
IF-IF	49.2	48.8	49.1	49.03	0.21
CRA-CRA	25	27.5	25.3	25.93	1.37
GPF-GPF	27.9	28.8	28.6	28.43	0.47
MRA-MRA	30.6	30.8	31	30.80	0.20
CR-CR	19.3	19.1	19.3	19.23	0.12
MF-MF	45.1	45.1	46.8	45.67	0.98
L-L	79.9	78.8	79.4	79.37	0.55
AvRM-AvRM	51.2	52.2	52.2	51.87	0.58

IF-IF	50.7	50.9	50.7	50.77	0.12
CRA-CRA	32.8	32.3	32.5	32.53	0.25
GPF-GPF	29.2	29.5	29.4	29.37	0.15
MRA-MRA	31.3	31.1	33	31.80	1.04
CR-CR	21.8	21.4	21.6	21.60	0.20
MF-MF	47	46.2	45.9	46.37	0.57
L-L	81	80.4	81.2	80.87	0.42
AvRM-AvRM	55.2	55.4	55.2	55.27	0.12
IF-IF	46.9	47.4	46.9	47.07	0.29
CRA-CRA	22.4	22.4	22.2	22.33	0.12
GPF-GPF	26.5	27.1	26.3	26.63	0.42
MRA-MRA	31.9	32	31.2	31.70	0.44
CR-CR	21.1	20.4	21.6	21.03	0.60
MF-MF	44.3	44	44.3	44.20	0.17
L-L	74.7	76.3	74.5	75.17	0.99
AvRM-AvRM	47.7	47.4	47.7	47.60	0.17
IF-IF	47	46.3	46.5	46.60	0.36
CRA-CRA	22.7	22.7	23.1	22.83	0.23
GPF-GPF	30	30.2	30.7	30.30	0.36
MRA-MRA	32.6	31.7	32.6	32.30	0.52
CR-CR	19	18.5	18.2	18.57	0.40
MF-MF	47.4	46.2	46.7	46.77	0.60
L-L	71.8	71.8	71.6	71.73	0.12
AvRM-AvRM	44	44.1	44	44.03	0.06
IF-IF	57.6	57.6	57.8	57.67	0.12
CRA-CRA	33.9	33.6	33.5	33.67	0.21
GPF-GPF	31.7	32.4	32.1	32.07	0.35
MRA-MRA	39	39.9	39.6	39.50	0.46
CR-CR	22.1	21.8	23.6	22.50	0.96
MF-MF	49.6	49.3	49	49.30	0.30
L-L	85.5	83.2	83.8	84.17	1.19
AvRM-AvRM	55.1	54.8	54.9	54.93	0.15
IF-IF	54.2	54.5	54.4	54.37	0.15
CRA-CRA	19.9	19.7	19.3	19.63	0.31
GPF-GPF	28.9	29.5	29.1	29.17	0.31

MRA-MRA	35.4	35.5	35.4	35.43	0.06
CR-CR	19.6	20.2	19.2	19.67	0.50
MF-MF	45.5	46.8	45.8	46.03	0.68
L-L	75.2	75.8	76.1	75.70	0.46
AvRM-AvRM	52.1	52.2	51.9	52.07	0.15
IF-IF	63.6	63	62.8	63.13	0.42
CRA-CRA	29.4	28.4	29.1	28.97	0.51
GPF-GPF	28.2	28.3	28.7	28.40	0.26
MRA-MRA	35.6	37.1	36.1	36.27	0.76
CR-CR	20.5	19.5	20.1	20.03	0.50
MF-MF	43.1	42.7	42.7	42.83	0.23
L-L	78.5	77.8	78.3	78.20	0.36
AvRM-AvRM	52.8	53.3	52.8	52.97	0.29
IF-IF	47.4	46.7	47.7	47.27	0.51
CRA-CRA	29	29.9	29.2	29.37	0.47
GPF-GPF	30.2	29.2	29.9	29.77	0.51
MRA-MRA	33.7	31.9	32.3	32.63	0.95
CR-CR	28.1	28.8	28.8	28.57	0.40
MF-MF	46.4	46.7	47	46.70	0.30
L-L	82.9	82.4	82.9	82.73	0.29
AvRM-AvRM	51.6	51.8	52	51.80	0.20
IF-IF	48.5	48.5	49.2	48.73	0.40
CRA-CRA	26.9	26.7	26.9	26.83	0.12
GPF-GPF	29	28.3	28.3	28.53	0.40
MRA-MRA	37.1	36.9	36.4	36.80	0.36
CR-CR	20.7	21.8	20.4	20.97	0.74
MF-MF	42.7	41.3	42	42.00	0.70
L-L	78.4	77.5	77	77.63	0.71
AvRM-AvRM	50.8	51.2	50.8	50.93	0.23
IF-IF	58.2	58.3	58.2	58.23	0.06
CRA-CRA	26.8	27.1	28.5	27.47	0.91
GPF-GPF	35.4	35.7	35.2	35.43	0.25
MRA-MRA	38.9	39.5	39.2	39.20	0.30
CR-CR	27.1	28.8	27.5	27.80	0.89
MF-MF	50.7	50.4	51	50.70	0.30
L-L	85	85.9	86.1	85.67	0.59

AvRM-AvRM	54.4	54.6	54.9	54.63	0.25
IF-IF	64	63.8	63.7	63.83	0.15
CRA-CRA	30.5	31.1	31.7	31.10	0.60
GPF-GPF	30.3	30.3	30.6	30.40	0.17
MRA-MRA	36.7	36.7	35.7	36.37	0.58
CR-CR	21.5	21.4	22.4	21.77	0.55
MF-MF	52.2	52.6	52.8	52.53	0.31
L-L	83.7	83.7	83.9	83.77	0.12
AvRM-AvRM	52.1	52.1	52.4	52.20	0.17
IF-IF	52.1	51.8	51.5	51.80	0.30
CRA-CRA	28.6	28.4	28.6	28.53	0.12
GPF-GPF	27.3	27.7	27.5	27.50	0.20
MRA-MRA	35	35.2	34.1	34.77	0.59
CR-CR	21.8	21.3	21.8	21.63	0.29
MF-MF	39.4	39.5	38.7	39.20	0.44
L-L	75.3	75.7	76.6	75.87	0.67
AvRM-AvRM	49.5	49.9	49.9	49.77	0.23